Northwestern Agricultural Research Center
of the
Department of Research Centers
Montana Agricultural Experiment Station
Montana State University

ANNUAL REPORT
2014 CROP YEAR

Bob Stougaard, Ph.D.
Superintendent and
Professor Weed Science/Agronomy

Jessica Torrion, Ph.D
Assistant Professor of Crop Physiology

Brooke Bohannon—Research Associate
John Garner— Research Assistant

Compiled by Dove Carlin, Administrative Associate

Northwestern Agricultural Research Center
4570 MT Highway 35
Kalispell, Montana 59901

Phone: (406) 755-4303 Fax: (406) 755-8951
Website: http://ag.montana.edu/nwarc

TABLE OF CONTENTS

NORTHWESTERN AGRICULTURAL RESEARCH CENTER
STAFF 2014

Full Time Staff Members

Brooke Bohannon, Research Associate

Dove Carlin, Administrative Associate III

Michael Davis, Assistant Farm Manager

John Garner, Research Assistant III

Jordan Penney, Farm Manager

Bob Stougaard, Superintendent – Professor, Weed Science

Jessica Torrion, Assistant Professor of Crop Physiology

Seasonal Employees

Brittney Brewer

Taryn Butts

Brad Carlin

Mary Ann Davis

Heidi Dettmering

Don Edsall

Dennara Gaub

Ashley Hubbard

Austin Jones

Chris Scott

Marcelle Tikka

Dustin Toavs

Bethany Updike

CLIMATOLOGY

Weather information as recorded at the
Northwestern Agricultural Research Center, Kalispell, Montana.

2013-2014 Weather Trend in Relation to the 24-year (1989-2013) Climate Data

This year's crop season was slightly colder in the fall and beginning of winter (Figure 1). For the most part, 2014 average temperature is in close agreement with the historically expected average temperature except in February – which dropped to about 10 degrees ^{o}F below the historical average. The sunlight received during the winter months was slightly above the historical average (Figure 2). There was also noticeably higher sunlight received in May during crop vegetative growth. The atmospheric evapotranspiration (ETo) demand was just slightly below the 10-yr average in June and July (Figure 3).

Figure 1. 2013-2014 monthly mean temperature relative to the maximum, minimum and mean historical ambient temperature.

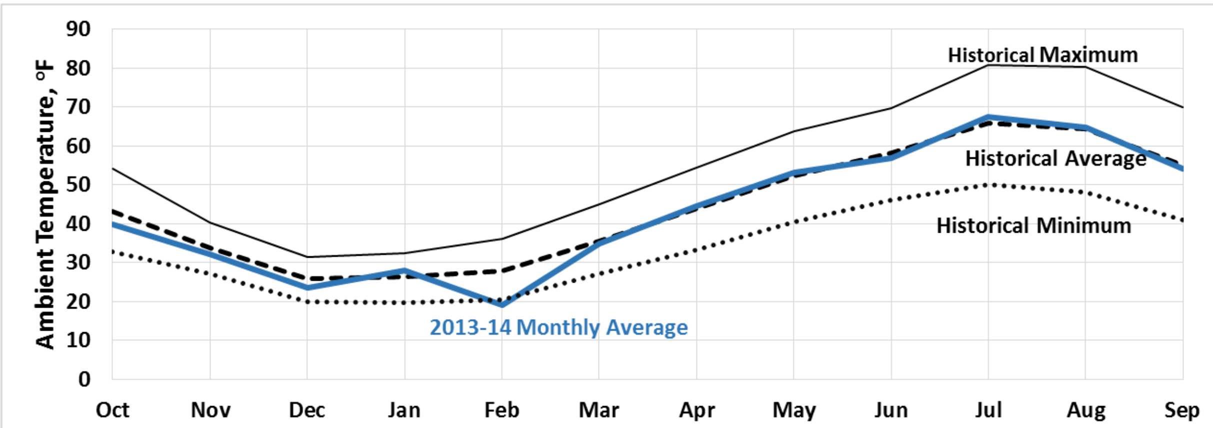


Figure 2. 2013-2014 monthly total solar global radiation relative to the historical monthly total.

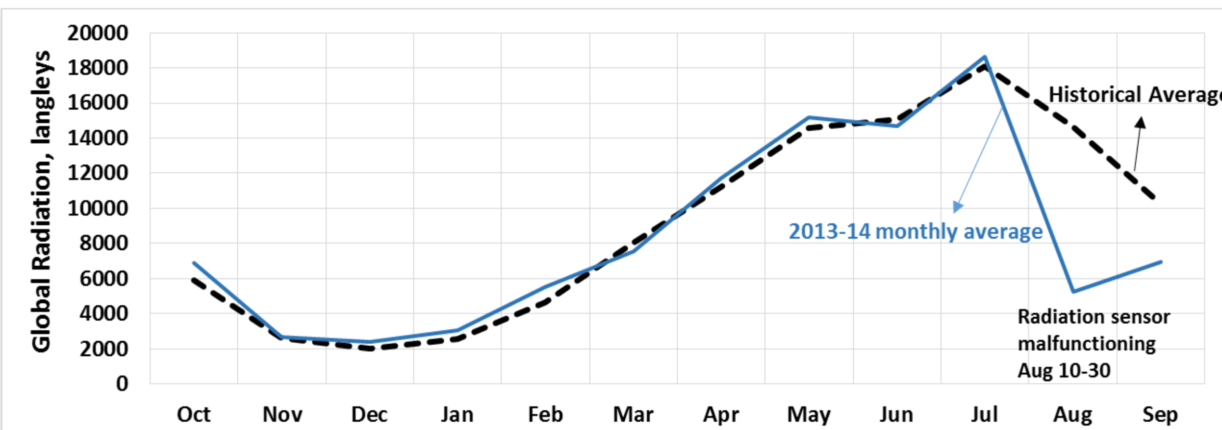
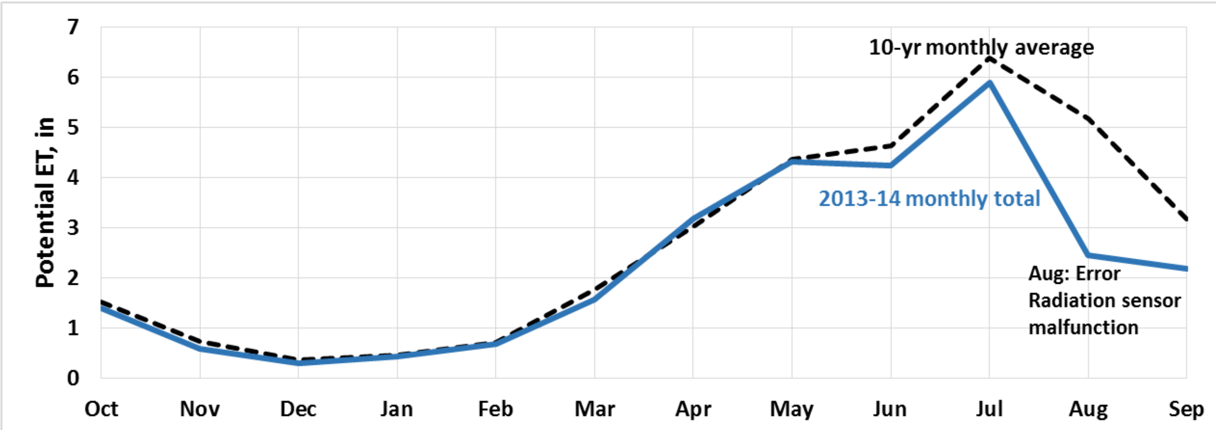
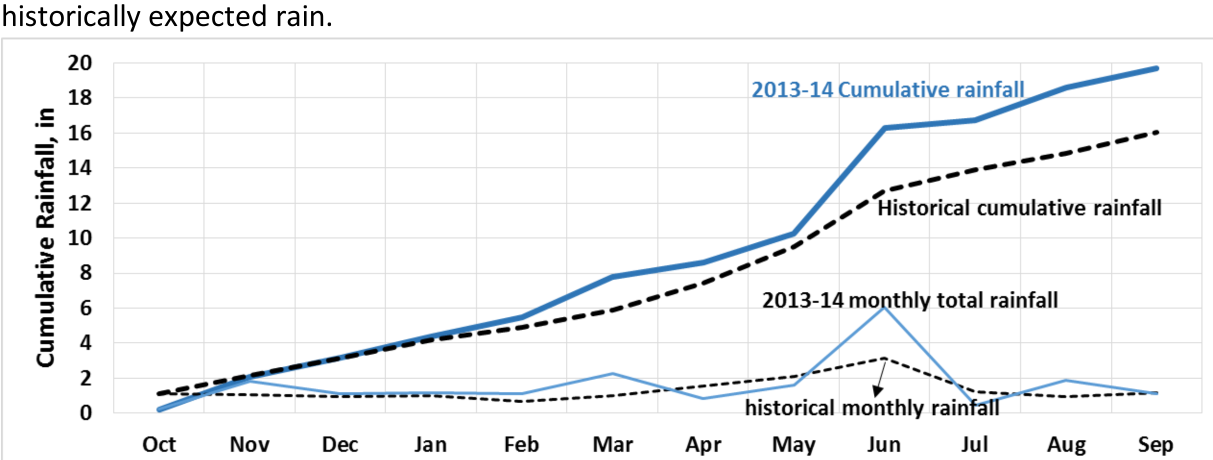


Figure 3. 2013-2014 monthly total potential evapotranspiration (ETo, grass reference) relative to the 10-yr ETo monthly total (2004-2014).



Overall, the monthly total rainfall received this year was above the historically expected rain except October, April and May. A full soil profile was observed at planting in spring. April and May were consistently lower than average by 0.70 and 0.50 inches, respectively. This prolonged low rainfall in two months caused coarse soil texture sites (i.e., fine sandy loam) to experience slight water stress in the vegetative stage of the crops. However, the amount of rain that occurred at mid-June recharged soil profiles to saturation. Total rain in June was twice the amount of the expected historical average (Figure 4). Such soil recharge to field capacity in June was advantageous to rainfed crops because at the onset of reproductive development in July, rainfall received was only 60% of expected (below average). From August 14-22, a total of 1.9 inches of rain was received which occurred during or just-after the occurrence of most cereals' physiological maturity. The combined effect of the ambient air, amount of sunlight received in May, the needed soil water recharge in June, plus the lower ET demand in June and July was seen to be advantageous to the crops. However, the rainfall received in August subjected wheat to probable postharvest sprout.

Figure 4. 2013-2014 monthly total rainfall and cumulative rainfall received relative to the historically expected rain.



Summary of Climatic Data by Months for the 2014 Crop Year: September 2013 - August 2014 and Averages for the Years 1980-2014 at the Northwestern Agricultural Research Center, Kalispell, Montana

	Sept. 2013	Oct. 2013	Nov. 2013	Dec. 2013	Jan. 2014	Feb. 2014	Mar. 2014	Apr. 2014	May 2014	June 2014	July 2014	Aug. 2014	
Precipitation (inches)													Total
Current Year	2.65	0.36	2	0.99	1.36	1.66	2.32	0.76	1.17	6.39	0.51	1.73	21.90
1981-2014	1.65	1.31	1.58	1.49	1.37	1.17	1.30	1.80	2.42	3.45	1.58	1.12	20.25
Average Temperature (F°)													Average
Current Year	57.2	39.6	31.4	21.9	26.6	17.1	33.2	42.3	51.8	55.9	66.6	65.1	42.4
1980-2014	53.9	42.1	32.5	24.2	24.6	26.9	34.9	42.9	51.3	57.4	64.4	63.5	43.2

Last killing frost[1] in spring

Spring 2014	May 13	31°F
Median for 1980-2014	May 19	

First killing frost[1] in fall

Fall 2014	September 11	27° F
Median for 1980-2014	September 19	

Frost Free Period

Avg. 1980-2014	127

Growing Degree Days April - August 2014

Base 50	68.0	215.5	269.0	523.5	491.0
Base 40	203.0	403.5	483.0	822.0	773.0
Base 32	345.5	618.0	716.5	1070.0	1020.0

Maximum summer temperature	90	July 30 & Aug 2
Minimum winter temperature	-23	Feb. 6 & 7

[1]. In this summary 32 degrees is considered a killing frost.

MAXIMUM / MINIMUM TEMPERATURES BY MONTH & DAY
JANUARY 2014- DECEMBER 2007

2014

YR	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
1	38	24	18	-2	16	-1	47	24	65	33	71	46	71	44	87	51	64	49	54	42	49	33	10	-6
2	38	23	21	-2	8	-4	52	26	72	42	71	41	78	48	90	55	69	46	55	43	42	33	15	4
3	43	28	22	15	11	-2	51	28	77	46	73	47	82	54	84	60	72	46	58	25	39	31	22	10
4	36	25	20	-5	36	11	54	30	49	37	63	44	82	51	82	53	54	44	68	35	45	37	18	11
5	27	3	8	-17	43	34	52	36	56	40	69	47	82	55	87	53	63	35	67	37	48	43	21	15
6	14	-4	6	-23	45	37	52	37	56	37	70	37	80	51	84	52	69	35	69	38	54	43	28	21
7	16	1	2	-23	45	36	56	34	56	34	70	38	84	59	87	50	73	37	73	44	60	44	38	28
8	22	12	7	-11	44	32	63	32	51	29	68	37	81	52	85	49	78	39	75	43	49	29	47	23
9	35	22	17	-4	49	34	70	34	62	39	73	47	83	54	84	49	73	38	71	40	51	29	47	23
10	38	29	16	4	54	33	58	34	64	38	75	41	86	54	83	45	54	40	71	37	41	22	33	29
11	40	31	25	5	37	28	59	35	54	33	71	39	86	54	85	48	49	27	68	36	28	6	47	29
12	43	34	43	21	46	28	57	31	53	26	69	42	82	50	88	50	53	25	60	44	20	4	47	29
13	43	33	47	32	49	26	42	17	59	31	75	46	86	51	84	54	58	28	58	44	19	1	47	29
14	46	28	45	31	53	27	47	19	65	41	58	46	88	56	86	55	63	30	61	33	21	-1	35	31
15	41	28	44	29	41	30	58	29	64	43	58	46	81	57	86	55	69	32	67	35	27	0	37	17
16	44	27	38	30	47	31	48	28	76	47	62	41	78	55	86	52	73	36	62	42	22	4	34	15
17	43	20	37	30	51	32	48	31	64	41	58	45	86	54	66	55	75	39	56	27	28	5	29	16
18	38	17	39	22	39	23	50	39	65	38	45	37	87	54	78	51	77	39	56	27	27	7	34	25
19	35	17	40	26	40	24	48	30	64	46	45	39	77	55	81	53	71	50	63	34	28	7	35	29
20	27	14	37	23	42	30	62	34	53	39	70	41	79	64	82	56	75	43	63	31	27	8	36	30
21	32	14	34	18	38	23	55	27	66	39	72	46	69	58	71	51	75	40	69	31	30	21	38	30
22	24	22	32	11	37	18	64	33	72	44	70	45	77	49	71	50	79	41	50	40	41	29	44	33
23	30	20	26	11	37	18	53	32	77	44	77	48	78	51	62	53	80	45	59	42	43	28	43	22
24	31	25	17	1	44	19	49	36	79	44	79	48	85	55	63	41	75	47	53	41	37	28	37	24
25	34	29	16	-8	45	24	48	34	69	46	76	53	65	49	65	38	85	42	53	36	38	31	32	19
26	33	28	22	-5	52	25	58	38	69	51	76	53	72	44	71	42	76	46	53	35	38	30	28	19
27	32	12	19	4	49	29	44	29	63	37	60	51	76	45	76	45	76	40	50	37	41	30	29	16
28	31	12	26	16	41	28	49	37	70	49	64	52	83	48	82	49	59	41	47	26	48	39	29	26
29	29	13			46	30	53	27	62	44	63	47	86	50	81	45	66	42	47	26	48	8	29	11
30	29	20			55	34	59	28	58	33	68	44	90	53	80	52	59	50	52	36	12	-4	16	-24
31	21	10			49	31			69	40			86	51	73	51			49	32			5	-21
AVG	33.3	19.9	25.9	8.2	41.6	24.8	53.5	31.0	63.8	39.7	67.3	44.5	80.8	52.4	79.7	50.4	68.7	39.7	59.9	36.1	36.7	20.8	31.9	18.2

MAXIMUM TEMPERATURE	90	°F	MINIMUM TEMPERATURE	-24

"M": missing data

Summary of Temperature Data at the Northwestern Agricultural Research Center
On a Crop Year Basis September 1980 - August 31, 2014
AVERAGE TEMPERATURE BY YEAR AND MONTH
In degrees Farenheit

YEAR	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	MEAN
1980-81	54.1	45.3	35.8	32.2	30.1	31.3	38.5	44.5	52.5	53.8	62.8	66.4	45.6
1981-82	55.3	43.2	36.0	27.0	21.6	24.5	37.5	39.4	49.8	59.8	61.1	63.0	43.2
1982-83	53.4	41.0	29.1	25.9	30.3	33.8	37.9	42.4	51.9	57.6	59.6	65.4	44.0
1983-84	50.4	42.9	36.6	11.1	27.6	32.4	38.3	42.2	48.7	56.4	65.3	64.6	43.0
1984-85	49.5	40.0	32.6	20.6	19.2	19.0	30.8	44.8	53.7	57.6	68.3	60.2	41.4
1985-86	47.8	40.8	18.6	18.3	25.4	25.6	40.6	43.8	53.7	63.9	59.9	66.1	42.0
1986-87	50.2	43.0	30.3	24.9	22.2	27.9	35.0	47.8	55.6	61.6	62.9	59.8	43.4
1987-88	56.1	43.3	35.3	25.4	20.5	30.3	37.8	45.7	51.4	60.9	63.7	63.9	44.5
1988-89	53.4	43.4	36.3	23.3	27.5	12.4	28.8	44.2	49.6	59.8	65.4	61.9	42.2
1989-90	52.7	42.7	35.8	25.3	30.5	24.5	34.8	45.2	49.8	57.2	65.2	64.8	44.0
1990-91	59.1	41.9	36.1	16.5	18.3	34.6	32.8	42.4	50.3	55.1	64.0	65.2	43.0
1991-92	54.4	40.6	32.1	29.3	28.7	34.5	39.7	45.1	53.5	55.5	61.2	61.8	44.7
1992-93	51.1	44.7	33.1	19.4	14.7	18.4	33.7	43.6	56.0	56.5	56.6	59.7	40.6
1993-94	51.4	44.4	25.0	27.4	32.9	20.6	37.5	45.4	54.0	57.3	66.4	63.0	43.8
1994-95	56.3	42.8	29.7	27.1	23.6	33.7	33.1	42.6	51.6	56.3	63.1	59.5	43.3
1995-96	54.9	41.1	34.9	26.7	17.4	24.0	29.0	43.2	46.6	58.5	65.4	62.5	42.0
1996-97	52.3	42.1	27.3	19.8	19.8	28.0	32.3	38.3	52.3	57.8	62.8	63.8	41.4
1997-98	55.6	43.7	33.0	27.9	25.1	33.0	34.9	44.5	54.1	56.0	68.4	65.6	45.2
1998-99	59.7	42.3	37.0	27.4	30.4	32.2	37.5	41.6	48.8	55.8	60.9	65.5	44.9
1999-00	51.3	42.9	38.1	31.0	25.8	26.3	36.9	43.4	50.4	56.2	63.9	63.4	44.1
2000-01	52.0	33.5	27.5	18.4	24.0	20.6	33.6	40.5	53.4	54.8	63.1	64.6	40.5
2001-02	57.3	42.0	36.6	27.0	27.2	25.7	25.0	41.6	47.5	57.7	67.2	60.4	42.9
2002-03	54.4	37.5	32.6	30.6	28.8	28.1	33.4	44.5	50.5	60.1	69.1	66.9	44.7
2003-04	55.5	46.3	27.3	24.2	21.1	27.6	39.5	45.1	51.0	57.3	66.0	64.0	43.7
2004-05	52.3	43.4	33.8	29.4	20.6	30.6	36.1	43.9	51.8	55.3	62.6	62.8	43.6
2005-06	51.0	43.6	32.6	18.1	33.2	24.2	35.5	43.9	52.6	60.7	69.1	63.8	44.0
2006-07	53.5	44.0	32.5	24.1	22.1	28.3	37.7	42.7	52.6	59.0	72.0	62.3	44.2
2007-08	53.6	40.3	32.6	26.2	19.7	30.2	32.9	37.8	47.0	55.6	65.1	63.6	42.1
2008-09	52.4	41.7	33.3	18.0	21.5	24.5	26.2	41.8	53.3	59.2	67.1	66.1	42.1
2009-10	60.1	38.9	35.3	18.0	26.4	31.4	37.9	41.2	47.1	56.0	61.9	61.4	43.0
2010-11	51.9	43.9	29.0	23.8	24.3	19.5	34.7	38.7	48.7	53.5	61.9	64.4	41.2
2011-12	56.2	43.3	31.6	28.0	26.4	28.2	36.7	45.2	48.8	54.9	65.2	63.1	44.0
2012-13	55.4	41.9	35.8	28.5	23.9	32.6	35.3	40.4	52.4	58.5	67.2	66.0	44.8
2013-14	57.2	39.6	31.4	21.9	26.6	17.1	33.2	42.3	51.8	55.9	66.6	65.1	42.4
MEAN	53.9	42.1	32.5	24.2	24.6	26.9	34.9	42.9	51.3	57.4	64.4	63.5	43.2

Mean temperature for all years = 43.2

Precipitation by Day for Crop Year September 2013- August 2014
Northwest Agriculture Research Center, Kalispell Montana

DAY	SEPT. 2013	OCT. 2013	NOV. 2013	DEC. 2013	JAN. 2014	FEB. 2014	MAR. 2014	APR. 2014	MAY 2014	JUNE 2014	JULY 2014	AUG. 2014
1	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.05	0.01	0.00	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0.00
3	0.01	0.00	0.04	0.08	0.02	0.00	0.32	0.00	0.00	0.01	0.00	0.00
4	0.00	0.00	0.07	0.00	0.30	0.00	0.11	0.00	0.10	0.26	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	T	0.00	0.00
6	0.08	0.00	0.23	0.00	0.00	0.00	0.51	0.07	0.01	0.00	0.00	0.00
7	0.10	0.00	0.03	0.00	0.00	0.01	0.02	0.00	T	0.00	0.00	0.00
8	0.00	0.00	0.18	0.01	0.26	0.03	0.00	0.00	0.00	0.00	0.00	0.00
9	0.28	0.19	0.00	0.02	0.02	0.00	0.00	0.00	0.04	0.00	0.00	0.00
10	0.00	0.00	0.18	0.26	0.11	0.02	0.00	0.00	0.18	0.00	0.00	0.00
11	0.00	0.00	0.60	0.05	0.03	0.12	0.41	0.00	0.10	0.01	0.00	0.00
12	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.01	0.04	0.00	0.03	0.00	0.08	0.00	0.11	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.77	0.00	0.01
15	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.37	0.26	0.09
16	0.00	0.00	0.27	0.00	0.00	0.00	0.00	0.12	0.00	0.07	0.00	1.00
17	0.14	0.07	0.17	0.00	0.00	0.00	0.08	0.02	T	1.08	0.00	0.05
18	0.91	0.00	0.00	0.00	0.00	0.28	0.12	0.04	0.03	1.29	0.00	0.00
19	0.62	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.01	1.81	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.24	0.00	0.00	0.37
21	0.00	0.00	0.00	0.18	0.00	0.11	0.01	0.00	0.00	0.00	0.15	0.01
22	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.11
23	0.15	0.00	0.00	0.12	0.00	0.00	0.01	0.10	0.00	0.00	0.04	0.09
24	0.09	0.00	0.00	0.17	0.04	0.32	0.00	0.00	0.03	0.00	0.04	0.00
25	0.10	0.00	0.00	0.00	0.01	0.60	0.00	0.14	0.00	0.02	0.01	0.00
26	0.06	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.00
27	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.14	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.04	0.27	0.00	0.26	0.11	0.00	0.00
29	0.02	0.00	0.07	0.00	0.06		0.01	0.00	0.00	0.29	0.00	0.00
30	0.09	0.00	0.12	0.02	0.41		0.06	0.00	0.00	0.04	0.00	0.00
31		0.00		0.00	0.10		0.03		0.00		0.01	0.00
TOTAL	2.65	0.36	2.00	0.99	1.36	1.66	2.32	0.76	1.17	6.39	0.51	1.73

Year to date 21.90

T=trace

Summary of Precipitation at the Northwestern Agricultural Research Center On a Crop Year Basis

Total Precipitation in Inches by Year and Month

YEAR	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	TOTAL
1980-81	1.20	0.83	0.78	2.58	1.81	1.85	2.17	1.75	3.86	4.70	1.17	0.96	23.66
1981-82	0.77	0.56	1.49	1.91	2.38	1.48	1.16	1.60	1.25	2.41	2.06	1.17	18.24
1982-83	2.37	0.75	1.39	1.60	0.93	0.85	1.71	2.41	1.20	2.96	3.66	1.16	20.99
1983-84	1.70	1.13	1.96	2.57	0.80	2.19	1.81	1.93	2.91	2.07	0.31	0.55	19.93
1984-85	2.15	2.25	1.40	1.29	0.31	1.28	0.90	1.31	2.81	1.89	0.35	1.62	17.56
1985-86	5.35	1.55	1.61	0.51	2.39	2.33	0.50	1.34	2.92	1.83	2.09	0.81	23.23
1986-87	3.63	0.80	1.78	0.63	0.38	0.46	3.47	1.15	1.89	1.95	4.85	0.98	21.97
1987-88	0.81	0.12	0.91	1.18	0.98	1.03	0.77	1.36	3.60	1.98	1.07	0.13	13.94
1988-89	2.30	0.62	1.39	1.69	1.39	1.48	2.29	1.09	2.70	2.05	2.70	3.69	23.39
1989-90	1.50	2.29	3.75	1.92	0.96	1.00	1.76	1.63	3.74	2.68	2.34	2.44	26.01
1990-91	T	2.32	1.37	2.60	1.41	0.41	0.72	1.21	2.72	5.36	0.77	1.15	20.04
1991-92	0.80	0.75	2.26	0.58	1.17	0.61	0.83	1.18	1.65	5.34	2.24	0.94	18.35
1992-93	1.21	1.07	2.37	1.53	1.68	0.60	0.73	3.77	2.22	4.00	7.00	1.19	27.37
1993-94	1.54	0.83	1.23	1.27	1.43	1.49	0.11	2.01	1.79	2.59	0.10	0.23	14.62
1994-95	0.46	2.12	1.89	1.07	1.17	0.90	2.33	2.25	1.44	5.63	1.91	1.47	22.64
1995-96	1.21	2.75	2.33	1.91	2.22	1.18	1.19	3.32	4.58	2.05	0.95	0.80	24.49
1996-97	2.67	1.58	3.99	3.52	1.50	1.62	1.18	1.69	2.62	3.41	0.99	1.94	26.71
1997-98	2.36	0.94	0.33	0.42	0.77	0.33	2.64	1.80	5.14	4.64	1.18	0.72	21.27
1998-99	1.48	0.71	1.11	1.47	1.05	1.18	0.90	0.55	1.32	2.74	1.63	1.93	16.07
1999-00	0.36	1.72	2.33	1.08	1.46	1.81	1.30	2.21	0.89	1.80	0.84	0.35	16.15
2000-01	1.40	1.23	0.62	1.23	0.75	1.54	1.03	2.62	0.57	3.29	0.91	0.54	15.73
2001-02	0.32	1.80	1.44	0.59	1.21	1.66	1.48	0.91	2.72	2.39	1.45	1.44	17.41
2002-03	1.18	0.25	0.87	1.67	1.63	1.01	2.32	2.23	1.78	1.57	0.05	0.35	14.91
2003-04	2.56	1.29	0.59	1.04	2.02	0.42	0.57	2.23	1.97	1.31	1.24	3.60	18.84
2004-05	1.89	1.62	0.84	1.49	1.38	0.01	1.41	2.21	1.73	8.44	0.26	0.56	21.84
2005-06	2.28	2.20	1.45	1.42	3.04	1.14	0.55	2.12	2.89	5.50	0.51	0.24	23.34
2006-07	1.95	1.10	2.28	0.95	0.39	2.26	0.54	1.62	3.29	1.35	0.75	0.23	16.71
2007-08	1.28	1.11	1.02	1.13	1.31	0.76	0.61	0.90	2.33	3.65	3.80	1.15	19.05
2008-09	1.57	0.61	1.71	2.37	1.72	1.59	1.43	0.98	1.62	1.98	2.44	0.99	19.01
2009-10	0.04	1.72	0.37	2.66	1.42	0.66	0.72	3.47	2.45	5.03	1.25	1.35	21.14
2010-11	1.71	0.74	2.77	1.69	2.43	1.61	0.87	2.25	3.20	4.48	0.99	0.24	22.98
2011-12	0.91	2.46	0.46	0.40	1.08	1.15	1.16	1.35	2.11	7.11	1.41	0.56	20.16
2012-13	0.75	2.46	1.66	1.84	0.67	0.20	0.66	2.12	3.29	2.76	0.03	0.93	17.37
2013-14	2.65	0.36	2.00	0.99	1.36	1.66	2.32	0.76	1.17	6.39	0.51	1.73	21.90
MEAN	1.65	1.31	1.58	1.49	1.37	1.17	1.30	1.80	2.42	3.45	1.58	1.12	20.25

Mean monthly precipitation for all crop years = 1.69

Summary of precipitation records at the Northwestern Agricultural Research Center
January 1980 - December 2014
Total Precipitation (inches) by Months and Years

DATE	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1981	1.81	1.85	2.17	1.75	3.86	4.70	1.17	0.96	0.77	0.56	1.49	1.91	23.00
1982	2.38	1.48	1.16	1.60	1.25	2.41	2.06	1.17	2.37	0.75	1.39	1.60	19.62
1983	0.93	0.85	1.71	2.41	1.20	2.96	3.66	1.16	1.70	1.13	1.96	2.57	22.24
1984	0.80	2.19	1.81	1.93	2.91	2.07	0.31	0.55	2.15	2.25	1.40	1.29	19.66
1985	0.31	1.28	0.90	1.31	2.81	1.89	0.35	1.62	5.35	1.55	1.61	0.51	19.49
1986	2.39	2.33	0.50	1.34	2.92	1.83	2.09	0.81	3.63	0.80	1.78	0.63	21.05
1987	0.38	0.46	3.47	1.15	1.89	1.95	4.85	0.98	0.81	0.12	0.91	1.18	18.15
1988	0.98	1.03	0.77	1.36	3.60	1.98	1.07	0.13	2.30	0.62	1.39	1.69	16.92
1989	1.39	1.48	2.29	1.09	2.70	2.05	2.70	3.69	1.50	2.29	3.75	1.92	26.85
1990	0.96	1.00	1.76	1.63	3.74	2.68	2.34	2.44	T	2.32	1.37	2.60	22.84
1991	1.41	0.41	0.72	1.21	2.72	5.36	0.77	1.15	0.80	0.75	2.26	0.58	18.14
1992	1.17	0.61	0.83	1.18	1.65	5.34	2.24	0.94	1.21	1.07	2.37	1.53	20.14
1993	1.68	0.60	0.73	3.77	2.22	4.00	7.00	1.19	1.54	0.83	1.23	1.27	26.06
1994	1.43	1.49	0.11	2.01	1.79	2.59	0.10	0.23	0.46	2.12	1.89	1.07	15.29
1995	1.17	0.90	2.33	2.25	1.44	5.63	1.91	1.47	1.21	2.75	2.33	1.91	25.30
1996	2.22	1.18	1.19	3.32	4.58	2.05	0.95	0.80	2.67	1.58	3.99	3.52	28.05
1997	1.50	1.62	1.18	1.69	2.62	3.41	0.99	1.94	2.36	0.94	0.33	0.42	19.00
1998	0.77	0.33	2.64	1.80	5.14	4.64	1.18	0.72	1.48	0.71	1.11	1.47	21.99
1999	1.05	1.18	0.90	0.55	1.32	2.74	1.63	1.93	0.36	1.72	2.33	1.08	16.79
2000	1.46	1.81	1.30	2.21	0.89	1.80	0.84	0.35	1.40	0.62	0.46	1.23	14.37
2001	0.75	1.54	1.03	2.62	0.57	3.29	0.91	0.54	0.32	1.80	1.44	0.59	15.40
2002	1.21	1.66	1.48	0.91	2.72	2.39	1.45	1.44	1.18	0.25	0.87	1.67	17.23
2003	1.63	1.01	2.32	2.23	1.78	1.57	0.05	0.35	2.56	1.29	0.59	1.04	16.42
2004	2.02	0.42	0.57	2.23	1.97	1.31	1.24	3.60	1.89	1.62	0.84	1.49	19.20
2005	1.38	0.01	1.41	2.21	1.73	8.44	0.26	0.60	2.28	2.20	1.45	1.42	23.39
2006	3.04	1.10	0.55	2.12	2.89	5.50	0.51	0.71	1.95	1.10	2.28	0.24	21.99
2007	0.39	2.26	0.54	1.62	3.29	1.35	0.75	0.23	1.28	1.11	1.02	1.13	14.97
2008	1.31	0.76	0.61	0.90	2.33	3.65	3.80	1.15	1.57	0.61	1.71	2.37	20.77
2009	1.72	1.59	1.43	0.98	1.62	1.98	2.44	0.99	0.04	1.72	0.37	2.66	17.54
2010	1.42	0.66	0.72	3.47	2.45	5.03	1.25	1.35	1.71	0.74	2.77	1.69	23.26
2011	2.43	1.61	0.87	2.25	3.20	4.48	0.99	0.24	0.91	2.46	0.46	0.40	20.30
2012	1.08	1.15	1.16	1.35	2.11	7.11	1.41	0.56	0.75	2.46	1.66	1.84	22.64
2013	0.67	0.20	0.66	2.12	3.29	2.76	0.03	0.93	2.65	0.36	2.00	0.99	16.66
2014	1.36	1.66	2.32	0.76	1.17	6.39	0.51	1.73	0.75	2.13	2.84	2.66	24.28
MEAN	1.37	1.17	1.30	1.80	2.42	3.45	1.58	1.14	1.63	1.33	1.64	1.48	20.26

YEAR 2014 - GROWING DEGREE DAYS JANUARY THROUGH OCTOBER

CALCULATED AT BASE 50, BASE 40, AND BASE 32

Page 1: January - May

JANUARY

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	38	24	0.0	0.0	3.0
2	38	23	0.0	0.0	3.0
3	43	28	0.0	1.5	5.5
4	36	25	0.0	0.0	2.0
5	27	3	0.0	0.0	0.0
6	14	-4	0.0	0.0	0.0
7	16	1	0.0	0.0	0.0
8	22	12	0.0	0.0	0.0
9	35	22	0.0	0.0	1.5
10	38	29	0.0	0.0	3.0
11	40	31	0.0	0.0	4.0
12	43	34	0.0	1.5	6.5
13	43	33	0.0	1.5	6.0
14	46	28	0.0	3.0	7.0
15	41	28	0.0	0.5	4.5
16	44	27	0.0	2.0	6.0
17	43	20	0.0	1.5	5.5
18	38	17	0.0	0.0	3.0
19	35	17	0.0	0.0	1.5
20	27	14	0.0	0.0	0.0
21	32	14	0.0	0.0	0.0
22	24	22	0.0	0.0	0.0
23	30	20	0.0	0.0	0.0
24	31	25	0.0	0.0	0.0
25	34	29	0.0	0.0	1.0
26	33	28	0.0	0.0	0.5
27	32	12	0.0	0.0	0.0
28	31	12	0.0	0.0	0.0
29	29	13	0.0	0.0	0.0
30	29	20	0.0	0.0	0.0
31	21	10	0.0	0.0	0.0

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
33.3	19.9	0.0	11.5	63.5

FEBRUARY

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	18	-2	0.0	0.0	0.0
2	21	-2	0.0	0.0	0.0
3	22	15	0.0	0.0	0.0
4	20	-5	0.0	0.0	0.0
5	8	-17	0.0	0.0	0.0
6	6	-23	0.0	0.0	0.0
7	2	-23	0.0	0.0	0.0
8	7	-11	0.0	0.0	0.0
9	17	-4	0.0	0.0	0.0
10	16	4	0.0	0.0	0.0
11	25	5	0.0	0.0	0.0
12	43	21	0.0	1.5	5.5
13	47	32	0.0	3.5	7.5
14	45	31	0.0	2.5	6.5
15	44	29	0.0	2.0	6.0
16	38	30	0.0	0.0	3.0
17	37	30	0.0	0.0	2.5
18	39	22	0.0	0.0	3.5
19	40	26	0.0	0.0	4.0
20	37	23	0.0	0.0	2.5
21	34	18	0.0	0.0	1.0
22	32	11	0.0	0.0	0.0
23	26	11	0.0	0.0	0.0
24	17	1	0.0	0.0	0.0
25	16	-8	0.0	0.0	0.0
26	22	-5	0.0	0.0	0.0
27	19	4	0.0	0.0	0.0
28	26	16	0.0	0.0	0.0

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
25.9	8.2	0.0	9.5	42.0

MARCH

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	16	-1	0.0	0.0	0.0
2	8	-4	0.0	0.0	0.0
3	11	-2	0.0	0.0	0.0
4	36	11	0.0	0.0	2.0
5	43	34	0.0	1.5	6.5
6	45	37	0.0	2.5	9.0
7	45	36	0.0	2.5	8.5
8	44	32	0.0	2.0	6.0
9	49	34	0.0	4.5	9.5
10	54	33	2.0	7.0	11.5
11	37	28	0.0	0.0	2.5
12	46	28	0.0	3.0	7.0
13	49	26	0.0	4.5	8.5
14	53	27	1.5	6.5	10.5
15	41	30	0.0	0.5	4.5
16	47	31	0.0	3.5	7.5
17	51	32	0.5	5.5	9.5
18	39	23	0.0	0.0	3.5
19	40	24	0.0	0.0	4.0
20	42	30	0.0	1.0	5.0
21	38	23	0.0	0.0	3.0
22	37	18	0.0	0.0	2.5
23	37	18	0.0	0.0	2.5
24	44	19	0.0	2.0	6.0
25	45	24	0.0	2.5	6.5
26	52	25	1.0	6.0	10.0
27	49	29	0.0	4.5	8.5
28	41	28	0.0	0.5	4.5
29	46	30	0.0	3.0	7.0
30	55	34	2.5	7.5	12.5
31	49	31	0.0	4.5	8.5

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
41.6	24.8	7.5	75.0	187.0

APRIL

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	47	24	0.0	3.5	7.5
2	52	26	1.0	6.0	10.0
3	51	28	0.5	5.5	9.5
4	54	30	2.0	7.0	11.0
5	52	36	1.0	6.0	12.0
6	52	37	1.0	6.0	12.5
7	56	34	3.0	8.0	13.0
8	63	32	6.5	11.5	15.5
9	70	34	10.0	15.0	20.0
10	58	34	4.0	9.0	14.0
11	59	35	4.5	9.5	15.0
12	57	31	3.5	8.5	12.5
13	42	17	0.0	1.0	5.0
14	47	19	0.0	3.5	7.5
15	58	29	4.0	9.0	13.0
16	48	28	0.0	4.0	8.0
17	48	31	0.0	4.0	8.0
18	50	39	0.0	5.0	12.5
19	48	30	0.0	4.0	8.0
20	62	34	6.0	11.0	16.0
21	55	27	2.5	7.5	11.5
22	64	33	7.0	12.0	16.5
23	53	32	1.5	6.5	10.5
24	49	36	0.0	4.5	10.5
25	48	34	0.0	4.0	9.0
26	58	38	4.0	9.0	16.0
27	44	29	0.0	2.0	6.0
28	49	37	0.0	4.5	11.0
29	53	27	1.5	6.5	10.5
30	59	28	4.5	9.5	13.5

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
53.5	31.0	68.0	203.0	345.5

MAY

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	65	33	7.5	12.5	17.0
2	72	42	11.0	17.0	25.0
3	77	46	13.5	21.5	29.5
4	49	37	0.0	4.5	11.0
5	56	40	3.0	8.0	16.0
6	56	37	3.0	8.0	14.5
7	56	34	3.0	8.0	13.0
8	51	29	0.5	5.5	9.5
9	62	39	6.0	11.0	18.5
10	64	38	7.0	12.0	19.0
11	54	33	2.0	7.0	11.5
12	53	26	1.5	6.5	10.5
13	59	31	4.5	9.5	13.5
14	65	41	7.5	13.0	21.0
15	64	43	7.0	13.5	21.5
16	76	47	13.0	21.5	29.5
17	64	41	7.0	12.5	20.5
18	65	38	7.5	12.5	19.5
19	64	46	7.0	15.0	23.0
20	53	39	1.5	6.5	14.0
21	66	39	8.0	13.0	20.5
22	72	44	11.0	18.0	26.0
23	77	44	13.5	20.5	28.5
24	79	44	14.5	21.5	29.5
25	69	46	9.5	17.5	25.5
26	69	51	10.0	20.0	28.0
27	63	37	6.5	11.5	18.0
28	70	49	10.0	19.5	27.5
29	62	44	6.0	13.0	21.0
30	58	33	4.0	9.0	13.5
31	69	40	9.5	14.5	22.5

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
63.8	39.7	215.5	403.5	618.0

YEAR 2014- GROWING DEGREE DAYS JANUARY THROUGH OCTOBER

CALCULATED AT BASE 50, BASE 40, AND BASE 32

Page 2: June - October

JUNE

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	71	46	10.5	18.5	26.5
2	71	41	10.5	16.0	24.0
3	73	47	11.5	20.0	28.0
4	63	44	6.5	13.5	21.5
5	69	47	9.5	18.0	26.0
6	70	37	10.0	15.0	21.5
7	70	38	10.0	15.0	22.0
8	68	37	9.0	14.0	20.5
9	73	47	11.5	20.0	28.0
10	75	41	12.5	18.0	26.0
11	71	39	10.5	15.5	23.0
12	69	42	9.5	15.5	23.5
13	75	46	12.5	20.5	28.5
14	58	46	4.0	12.0	20.0
15	58	46	4.0	12.0	20.0
16	62	41	6.0	11.5	19.5
17	58	45	4.0	11.5	19.5
18	45	37	0.0	2.5	9.0
19	45	39	0.0	2.5	10.0
20	70	41	10.0	15.5	23.5
21	72	46	11.0	19.0	27.0
22	70	45	10.0	17.5	25.5
23	77	48	13.5	22.5	30.5
24	79	48	14.5	23.5	31.5
25	76	53	14.5	24.5	32.5
26	76	53	14.5	24.5	32.5
27	60	51	5.5	15.5	23.5
28	64	52	8.0	18.0	26.0
29	63	47	6.5	15.0	23.0
30	68	44	9.0	16.0	24.0

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
67.3	44.5	269.0	483.0	716.5

JULY

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	71	44	10.5	17.5	25.5
2	78	48	14.0	23.0	31.0
3	82	54	18.0	28.0	36.0
4	82	51	16.5	26.5	34.5
5	82	55	18.5	28.5	36.5
6	80	51	15.5	25.5	33.5
7	84	59	21.5	31.5	39.5
8	81	52	16.5	26.5	34.5
9	83	54	18.5	28.5	36.5
10	86	54	20.0	30.0	38.0
11	86	54	20.0	30.0	38.0
12	82	50	16.0	26.0	34.0
13	86	51	18.5	28.5	36.5
14	88	56	21.0	31.0	39.0
15	81	57	19.0	29.0	37.0
16	78	55	16.5	26.5	34.5
17	86	54	20.0	30.0	38.0
18	87	54	20.0	30.0	38.0
19	77	55	16.0	26.0	34.0
20	79	64	21.5	31.5	39.5
21	69	58	13.5	23.5	31.5
22	77	49	13.5	23.0	31.0
23	78	51	14.5	24.5	32.5
24	85	55	20.0	30.0	38.0
25	65	49	7.5	17.0	25.0
26	72	44	11.0	18.0	26.0
27	76	45	13.0	20.5	28.5
28	83	48	16.5	25.5	33.5
29	86	50	18.0	28.0	36.0
30	90	53	19.5	29.5	37.5
31	86	51	18.5	28.5	36.5

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
80.8	52.4	523.5	822.0	1070.0

AUGUST

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	87	51	19.0	28.5	36.5
2	90	55	22.5	30.5	38.5
3	84	60	22.0	32.0	40.0
4	82	53	17.5	27.5	35.5
5	87	53	20.0	29.5	37.5
6	84	52	18.0	28.0	36.0
7	87	50	18.5	28.0	36.0
8	85	49	17.5	27.0	35.0
9	84	49	17.0	26.5	34.5
10	83	45	16.5	24.0	32.0
11	85	48	17.5	26.5	34.5
12	88	50	19.0	28.0	36.0
13	84	54	19.0	29.0	37.0
14	86	55	20.5	30.5	38.5
15	86	55	20.5	30.5	38.5
16	86	52	19.0	29.0	37.0
17	66	55	10.5	20.5	28.5
18	78	51	14.5	24.5	32.5
19	81	53	17.0	27.0	35.0
20	82	56	19.0	29.0	37.0
21	71	51	11.0	21.0	29.0
22	71	50	10.5	20.5	28.5
23	62	53	7.5	17.5	25.5
24	63	41	6.5	12.0	20.0
25	65	38	7.5	12.5	19.5
26	71	42	10.5	16.5	24.5
27	76	45	13.0	20.5	28.5
28	82	49	16.0	25.5	33.5
29	81	45	15.5	23.0	31.0
30	80	52	16.0	26.0	34.0
31	73	51	12.0	22.0	30.0

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
79.7	50.4	491.0	773.0	1020.0

SEPTEMBER

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	64	49	7.0	6.5	24.5
2	69	46	9.5	7.5	25.5
3	72	46	11.0	9.0	27.0
4	54	44	2.0	0.0	17.0
5	63	35	6.5	1.5	17.0
6	69	35	9.5	4.5	20.0
7	73	37	11.5	6.5	23.0
8	78	39	14.0	9.0	26.5
9	73	38	11.5	6.5	23.5
10	54	40	2.0	0.0	15.0
11	49	27	0.0	0.0	8.5
12	53	25	1.5	0.0	10.5
13	58	28	4.0	0.0	13.0
14	63	30	6.5	1.5	15.5
15	69	32	9.5	4.5	18.5
16	73	36	11.5	6.5	22.5
17	75	39	12.5	7.5	25.0
18	77	39	13.5	8.5	26.0
19	71	50	10.5	10.5	28.5
20	75	43	12.5	9.0	27.0
21	75	40	12.5	7.5	25.5
22	79	41	14.5	10.0	28.0
23	80	45	15.0	12.5	30.5
24	75	47	12.5	11.0	29.0
25	85	42	17.5	13.5	31.5
26	76	46	13.0	11.0	29.0
27	76	40	13.0	8.0	26.0
28	59	41	4.5	0.0	18.0
29	66	42	8.0	4.0	22.0
30	59	50	4.5	4.5	22.5

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
68.7	39.7	281.5	181.0	676.0

OCTOBER

	Temperatures		Growing Degree Days		
Day	MAX	MIN	Base 50	Base 40	Base 32
1	54	42	2.0	8.0	16.0
2	55	43	2.5	9.0	17.0
3	58	25	4.0	9.0	13.0
4	68	35	9.0	14.0	19.5
5	67	37	8.5	13.5	20.0
6	69	38	9.5	14.5	21.5
7	73	44	11.5	18.5	26.5
8	75	43	12.5	19.0	27.0
9	71	40	10.5	15.5	23.5
10	71	37	10.5	15.5	22.0
11	68	36	9.0	14.0	20.0
12	60	44	5.0	12.0	20.0
13	58	44	4.0	11.0	19.0
14	61	33	5.5	10.5	15.0
15	67	35	8.5	13.5	19.0
16	62	42	6.0	12.0	20.0
17	56	27	3.0	8.0	12.0
18	56	27	3.0	8.0	12.0
19	63	34	6.5	11.5	16.5
20	63	31	6.5	11.5	15.5
21	69	31	9.5	14.5	18.5
22	50	40	0.0	5.0	13.0
23	59	42	4.5	10.5	18.5
24	53	41	1.5	7.0	15.0
25	53	36	1.5	6.5	12.5
26	53	35	1.5	6.5	12.0
27	50	37	0.0	5.0	11.5
28	47	26	0.0	3.5	7.5
29	47	26	0.0	3.5	7.5
30	52	36	1.0	6.0	12.0
31	49	32	0.0	4.5	8.5

AV MAX	AV MIN	Total Base 50	Total Base 40	Total Base 32
59.9	36.1	157.0	321.0	511.5

Julian Date Calendar for Year 2014

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	32	60	91	121	152	182	213	244	274	305	335
2	2	33	61	92	122	153	183	214	245	275	306	336
3	3	34	62	93	123	154	184	215	246	276	307	337
4	4	35	63	94	124	155	185	216	247	277	308	338
5	5	36	64	95	125	156	186	217	248	278	309	339
6	6	37	65	96	126	157	187	218	249	279	310	340
7	7	38	66	97	127	158	188	219	250	280	311	341
8	8	39	67	98	128	159	189	220	251	281	312	342
9	9	40	68	99	129	160	190	221	252	282	313	343
10	10	41	69	100	130	161	191	222	253	283	314	344
11	11	42	70	101	131	162	192	223	254	284	315	345
12	12	43	71	102	132	163	193	224	255	285	316	346
13	13	44	72	103	133	164	194	225	256	286	317	347
14	14	45	73	104	134	165	195	226	257	287	318	348
15	15	46	74	105	135	166	196	227	258	288	319	349
16	16	47	75	106	136	167	197	228	259	289	320	350
17	17	48	76	107	137	168	198	229	260	290	321	351
18	18	49	77	108	138	169	199	230	261	291	322	352
19	19	50	78	109	139	170	200	231	262	292	323	353
20	20	51	79	110	140	171	201	232	263	293	324	354
21	21	52	80	111	141	172	202	233	264	294	325	355
22	22	53	81	112	142	173	203	234	265	295	326	356
23	23	54	82	113	143	174	204	235	266	296	327	357
24	24	55	83	114	144	175	205	236	267	297	328	358
25	25	56	84	115	145	176	206	237	268	298	329	359
26	26	57	85	116	146	177	207	238	269	299	330	360
27	27	58	86	117	147	178	208	239	270	300	331	361
28	28	59	87	118	148	179	209	240	271	301	332	362
29	29		88	119	149	180	210	241	272	302	333	363
30	30		89	120	150	181	211	242	273	303	334	364
31	31		90		151		212	243		304		365

CEREALS

Title: Barley Off Station - 2014

Objective: To evaluate the agronomic performance of barely varieties grown in environments representative of northwestern Montana.

Results:

Yields averaged 128.3 lb/A and ranged from 94.6 bu/A for Cowboy to 171.8 bu/A for MT100120. Tradition, the highest yielding commercially available cultivar, produced 145.3 bu/A. Heading dates averaged 182 Julian days (July 1) and ranged from 178 to 185 Julian days. Protein averaged 14.7% and ranged from 12.9% for MT100120 to 16.3% for Conrad. Test weight averaged 50.0 lb/bu and ranged from 47.5 for Tradition to 52.8 lb/bu for MT100126. Heights averaged 39.0 inches and ranged from 35.3 for Eslick to 43.0 inches for Metcalfe. Lodging averaged 33.7% and ranged from 2.0% for MT100120 to 87.3% for Cowboy. All 16 cultivars experienced lodging, 6 of these were over 50%, while 4 of them were under 5%.

Summary:
This year's high yield average of 128.3 bu/A compared to 93.5 lb/A in 2013, can be attributed favorable growing conditions.

Table 1. Materials and Methods - Barley Off Station - 2014

Seeding Date:	4/30/2014	Harvest Date:	8/29/2014
Julian Date:	120	Julian Date:	241
Seeding Rate:	80 lb/A	Soil Type:	Creston Sil
Previous Crop:	Alfalfa	Soil Test:	163-14-138
Tillage:	Conventional	Fertilizer:	200-30-100
Irrigation:	None	Herbicide:	Huskie 11 floz/A and Axial XL 16.4 floz/A

Table 2. Barley off station - 2014

Treatment	HD Julian	HT in	LOD %	YLD bu/A	PRO %	TWT lb/bu	PLMP %
MT100120	182	42.0	2.0	171.8	12.9	52.0	95.9
MT100126	183	40.7	9.0	157.4	13.2	52.8	95.8
MT090180	183	38.7	5.0	153.8	13.2	52.0	95.5
Tradition	178	41.0	5.0	145.3	14.4	47.5	83.2
Conrad	185	38.0	2.3	141.2	16.3	49.9	93.0
Craft	179	39.7	13.3	140.3	14.7	52.2	88.8
Geraldine	179	38.7	27.7	129.0	15.1	48.8	81.7
MT090190	184	39.3	18.0	125.6	15.8	51.0	96.4
Haxby	180	39.3	18.3	124.7	15.6	49.3	88.2
Eslick	184	35.3	26.7	121.7	15.1	48.5	79.4
Hockett	180	36.0	58.0	112.2	14.4	50.1	86.8
Metcalfe	184	43.0	56.7	111.8	15.0	47.6	88.3
Gallatin	178	36.3	53.3	109.9	14.7	49.1	80.3
Champion	180	38.0	82.0	109.6	14.6	50.3	82.7
Harrington	182	40.3	75.0	103.6	14.5	48.7	89.2
Cowboy	184	37.7	87.3	94.6	15.4	50.5	93.1
Mean	182	39.0	33.7	128.3	14.7	50.0	88.7
CV	0.8	6.5	70.0	12.5	3.2	2.7	5.8
LSD	2.4	4.3	39.3	26.7	0.8	2.3	8.6
Pr>F	0.0001	0.0418	0.0001	0.0001	0.0001	0.0003	0.0007

HD: heading, HT: height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight, PLMP: percent plumps

Title: Intrastate Barley Evaluation – 2014

Objective: To evaluate barley varieties and experimental lines for agronomic performance in environments and cropping systems representative of northwestern Montana.

Results:

Significant differences were observed for heading, height, lodging, yield, and test weight. Heading dates averaged 179 Julian days (June 28) and ranged from 173 to 183 Julian days. The average height was 33.6 inches and ranging from 27.7 to 39.0 inches. Lodging was minimal, averaging 5.4%. Yields averaged 129.7 bu/A and ranged from 71.4 bu/A for MT110109 to 176.1 bu/A for MT100128. Champion, the highest yielding commercially available cultivar, produced 141.9 bu/A. Test weights averaged 50.6 lb/bu and ranged from 44.6 lb/bu for Tradition to 58.0 lb/bu for MT110097. Protein content averaged 14.3% and ranged from 12.4% for MT100126 to 18.0% for MT110095. Percent plump averaged 83.5% ranging from 28.2% for MT110109 to 97.5% for 07034-012.

Summary:

The highest yielding commercially available cultivars were Champion and Craft.

Table 1. Materials and Methods - Intrastate Barley Evaluation - 2014

Seeding Date:	4/29/2014	Harvest Date:	8/28/2014
Julian Date:	119	Julian Date:	240
Seeding Rate:	80 lb/A	Soil Type:	Kalispell VFSL
Previous Crop:	Canola	Soil Test:	196-10-100
Tillage:	Conventional-till	Fertilizer:	200-30-100
Irrigation:	N/A	Herbicide:	Huskie 11 floz/A and Axial XL 16.4 floz/A

Table 2. Intrastate Barley Evaluation. Kalispell, 2014

Cultivar	HD Julian	HT in	LOD %	YLD bu/A	PRO %	TWT lb/bu	PLMP %
MT100128	182	33.0	5.0	176.1	12.8	52.8	93.9
MT100136	180	34.0	5.0	174.2	12.8	51.3	90.3
MT100120	181	33.3	5.0	169.4	12.7	52.6	92.5
MT100126	181	34.0	5.0	166.5	12.4	52.5	92.1
MT100132	182	35.3	5.0	165.2	12.8	51.9	90.7
MT090193	181	36.7	5.0	164.4	13.1	51.5	87.3
MT090186	182	33.7	5.0	162.3	12.9	51.7	91.2
MT090190	181	34.3	5.0	161.9	12.9	52.1	92.5
MT090184	180	33.7	5.0	159.7	13.0	51.6	91.2
MT100130	179	36.7	5.0	156.7	13.1	50.1	85.5
MT100124	181	33.0	5.0	154.8	12.8	50.5	85.4
MT090180	181	34.0	5.0	151.6	13.0	50.8	88.7
MT090182	179	34.7	5.0	151.0	12.7	50.9	90.3
MT124243	181	34.3	5.0	150.6	12.7	50.1	86.7
MT124093	177	39.0	6.7	150.2	14.2	51.6	91.4
MT124367	182	37.0	1.7	150.0	13.1	50.8	93.9
MT124688	177	33.7	6.7	147.7	12.9	51.6	89.9
MT100125	180	35.0	5.0	147.4	12.8	50.9	89.7
MT124945	179	34.3	1.7	147.4	.	50.5	.
07005-007	178	31.7	5.0	144.8	15.4	50.1	95.4
MT124411	176	34.0	6.7	144.5	13.9	51.7	91.2
MT090181	181	35.7	6.7	143.2	13.1	51.8	92.3
MT100051	176	30.7	5.0	143.1	16.5	49.9	81.2
MT124582	176	35.7	5.0	142.2	13.6	49.9	85.4
MT124025	181	34.3	3.3	142.0	12.8	49.6	87.6
Champion	179	30.8	10.0	141.9	13.7	50.4	90.9
Craft	176	38.3	5.0	140.8	13.8	50.9	84.7
MT100060	177	30.5	5.0	140.1	13.2	51.6	86.4
MT124026	179	33.7	5.0	138.3	13.5	49.3	91.9
05032-068	178	32.7	31.7	138.3	14.0	48.7	85.4
07034-012	176	34.7	36.7	136.5	14.9	51.0	97.5
MT124338	179	34.0	5.0	135.8	13.2	50.4	87.0
07030-034	180	33.7	6.7	135.6	14.3	48.8	95.7
Harrington	178	36.0	6.7	134.9	14.0	48.6	87.2
MT124027	180	32.3	3.3	133.8	13.0	48.4	86.1
Tradition	175	36.7	3.3	133.7	17.3	44.6	59.5
Hockett	178	29.7	6.7	131.3	13.5	49.5	90.1
Metcalfe	178	35.7	5.0	131.3		48.1	
MT124240	181	34.7	5.0	130.8	13.1	49.6	86.8
07034-005	176	27.7	10.0	129.5	15.1	48.5	94.8

Table 2. continued

Cultivar	HD Julian	HT in	LOD %	YLD bu/A	PRO %	TWT lb/bu	PLMP %
Pinnacle	176	35.3	5.0	129.0	13.0	49.8	94.4
Conrad	180	31.0	3.3	125.3	15.2	48.9	85.4
MT124933	176	32.3	5.0	121.8	15.2	48.3	78.9
MT110008	181	33.2	6.7	120.2	15.8	49.7	71.5
MT124728	179	32.0	5.0	118.6	15.0	49.0	88.1
Haxby	177	34.3	6.7	117.0	14.6	50.4	81.2
Eslick	183	28.7	0.0	115.3	13.8	48.8	78.8
MT110065	183	35.0	1.7	110.8	16.5	47.2	51.5
MT110066	181	33.7	0.0	108.9	16.4	52.4	53.0
MT110009	181	38.0	0.0	105.4	13.6	51.4	88.9
MT110139	173	38.0	6.7	102.9	12.8	53.1	88.3
MT110016	179	31.0	5.0	102.8	15.8	47.6	69.0
MT110092	174	30.0	0.0	98.2	14.5	56.2	92.0
MT110061	182	35.0	0.0	97.6	16.5	49.8	55.5
Hays	177	29.7	0.0	97.0	15.3	45.8	57.6
MT110097	174	33.0	0.0	95.4	14.8	58.0	91.7
MT110141	176	33.8	0.0	84.9	16.3	55.3	87.9
MT110095	174	37.7	15.0	83.4	18.0	56.7	85.0
MT110130	175	30.0	0.0	82.9	16.5	48.7	55.2
MT110043	182	33.7	13.3	82.0	16.4	48.9	72.1
MT110113	174	31.8	0.0	80.3	16.7	50.2	89.7
PI596299	177	31.7	5.0	75.6	14.5	45.6	84.9
MT110031	176	28.7	0.0	75.0	16.9	52.3	66.8
MT110109	175	33.0	0.0	71.4	16.5	55.1	28.2
Mean	179	33.6	5.4	129.7	14.3	50.6	83.5
CV	0.8	7.2	123.8	8.2	NA	2.8	NA
LSD	2.3	3.9	10.8	21.2	NA	2.3	NA
Pr>F	0.0001	0.0001	0.0001	0.0001	NA	0.0001	NA

HD: heading, HT: height, LOD: lodging, YLD: yield,
PRO: protein, TWT: test weight, PLMP: percent plumps

Project Title:	Nitrogen use response of irrigated spring wheat
Project Leader:	Jessica Torrion (PI), Bob Stougaard (Co-PI)
Project Personnel:	John Garner, Brooke Bohannon
Objective:	To evaluate variety-specific nitrogen use response of irrigated spring wheat for agronomic performance.

Summary:

Eight spring wheat cultivars were grown under four different nitrogen levels as a split plot, randomized complete block design, with four replications, where nitrogen levels represent the whole plot factor and the spring wheat varieties were the sub plot factor. The four nitrogen treatments included no added fertilizer and 150, 300, and 450 pounds/A, respectively, based on soil test N levels plus supplemental N fertilization. Irrigation was applied when necessary to keep soil moisture from falling below 50% of the plant available water. Other agronomic management procedures are detailed in Table 1.

Significant interactions were observed between nitrogen and variety for protein, days to maturity, test weight and grain moisture. Nitrogen treatment had significant effect on yield and seed size (Table 2). Volt had the highest yield and Brennan and WB Rockland the least. The known inverse relationship between yield and protein is evident (Figure 1). Plant height and falling number were not influenced by the N treatment, but appeared to be strongly related to variety.

Figure 2 shows variety-specific nitrogen use efficiency (NUE) segregated into Partial Productivity (PFP) for the total N input (soil + fertilizer) vs. N from fertilizer input. As expected, NUE for all varieties decreased as 300 lbs N or greater was applied. Consistently, McNeal and Volt had superior NUE followed by Cabernet, Solano, Expresso, and Buck Pronto. WB Rockland and Brennan consistently had the lowest NUEs.

Table 1. Materials and methods.

Seeding Date:	4/23/14	Herbicide:	5/30/14
Julian Date:	113		Huskie 11 floz/ac, Axial XL 16.4 floz/ac
Seeding Rate:	20 plnts/sqft	Insecticide:	7/1/14
Previous Crop:	Canola		Warrior II 1.5 floz/ac
Tillage:	Conventional	Fungicide:	7/1/14
Irrigation:	Yes		Headline 7 floz/ac
Soil Type:	Fine sandy loam	Harvest Date:	8/26/14
Soil Test:	120-14-69	Julian Date:	238
Fertilizer:	___-10-100		

Table 2. Spring wheat nitrogen effects on agronomic performance — 2014

Variety	HT in	PM* days	SS seeds/lb	MC %	YLD bu/A	PRO %	TWT lb/bu	TKW g	FN sec
80 lbs N (no added fertilizer)									
Brennan	29.6	85	11,337	13.5	96.4	15.3	60.2	40.0	280
Buck Pronto	29.6	91	9,191	14.1	117.7	13.9	60.5	49.4	376
Cabernet	25.6	93	10,886	13.3	118.6	13.0	59.7	41.7	350
Expresso	27.9	95	11,053	13.5	123.0	14.3	61.0	41.1	373
McNeal	33.2	93	10,013	14.1	129.0	13.4	61.3	45.4	444
Solano	27.1	93	10,600	13.4	119.5	14.2	60.5	42.8	373
Volt	29.6	93	12,077	13.9	130.6	12.7	62.6	37.6	390
WB Rockland	26.6	92	10,435	13.3	106.3	15.5	59.9	43.5	382
150 lbs N (soil + fertilizer)									
Brennan	28.4	88	11,521	13.4	111.3	15.2	60.8	39.4	283
Buck Pronto	33.3	95	9,251	14.1	126.0	14.8	60.4	49.1	369
Cabernet	26.8	93	11,091	13.0	131.3	13.4	59.6	40.9	333
Expresso	29.1	95	10,967	13.8	130.2	14.4	61.1	41.4	357
McNeal	36.0	94	10,206	14.2	146.5	14.2	61.5	44.5	410
Solano	27.5	94	10,540	13.6	132.1	14.3	60.8	43.1	362
Volt	32.6	95	12,184	14.4	144.6	13.1	62.6	37.3	372
WB Rockland	25.9	95	10,432	13.3	116.0	15.7	60.3	43.5	361
300 lbs N (soil + fertilizer)									
Brennan	29.3	94	11,623	13.2	105.7	15.5	60.6	39.0	278
Buck Pronto	29.9	94	9,351	14.3	123.0	14.8	59.9	48.6	374
Cabernet	24.9	94	11,189	13.4	126.3	13.4	59.7	40.6	339
Expresso	28.0	95	11,424	13.4	123.9	14.1	60.7	39.7	375
McNeal	32.2	94	10,666	14.2	130.1	14.2	61.1	42.6	410
Solano	26.6	95	10,792	13.5	123.9	14.3	60.7	42.1	366
Volt	29.7	96	12,340	14.1	141.6	13.1	62.4	36.8	386
WB Rockland	27.4	95	10,788	13.1	112.7	15.7	60.2	42.1	381
450 lbs N (soil + fertilizer)									
Brennan	27.6	93	11,547	13.2	101.5	15.7	60.7	39.3	297
Buck Pronto	28.8	95	9,338	14.3	115.3	15.1	60.0	48.6	360
Cabernet	27.0	93	11,270	13.0	115.0	13.9	59.6	40.3	333
Expresso	27.8	96	11,388	13.7	118.6	14.6	60.5	39.9	348
McNeal	32.8	96	10,635	14.1	130.8	14.6	60.8	42.7	423
Solano	25.7	94	11,016	13.5	113.5	14.4	60.2	41.2	346
Volt	30.4	94	12,542	14.4	135.5	13.0	61.9	36.2	383
WB Rockland	27.8	95	10,552	13.2	105.6	15.8	60.0	43.0	361
C.V	12.1	3.1	8.3	3.7	12.8	7.3	1.4	8.5	13.1
LSD	2.0	2.1	216.0	0.2	7.6	0.6	0.9	0.9	32.0
$Pr>F_{(0.05)\text{ - N}}$	0.152	0.007	0.002	0.419	0.002	0.090	0.007	0.002	0.435
$Pr>F_{(0.05)\text{ - Var}}$	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
$Pr>F_{(0.05)\text{- N x Var}}$	0.824	<0.0001	0.881	0.041	0.484	0.010	0.019	0.831	0.899

HT: height, PM: physiological maturity *(duration from emergence), SS: seed size, MC: moisture content, YLD: yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, FN: falling number.

Figure 1. Varietal response on yield, protein, falling number, and seed size to N levels.

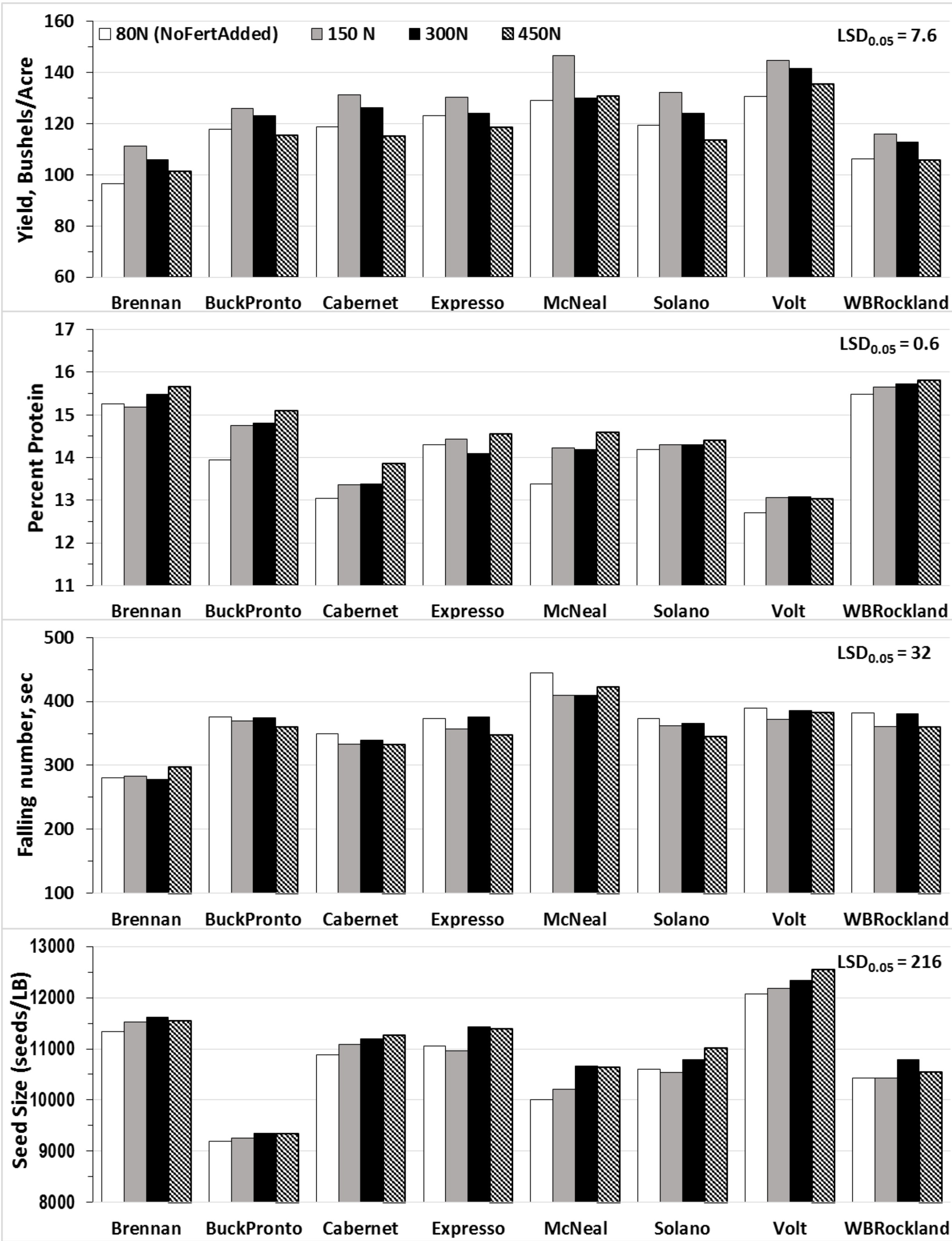
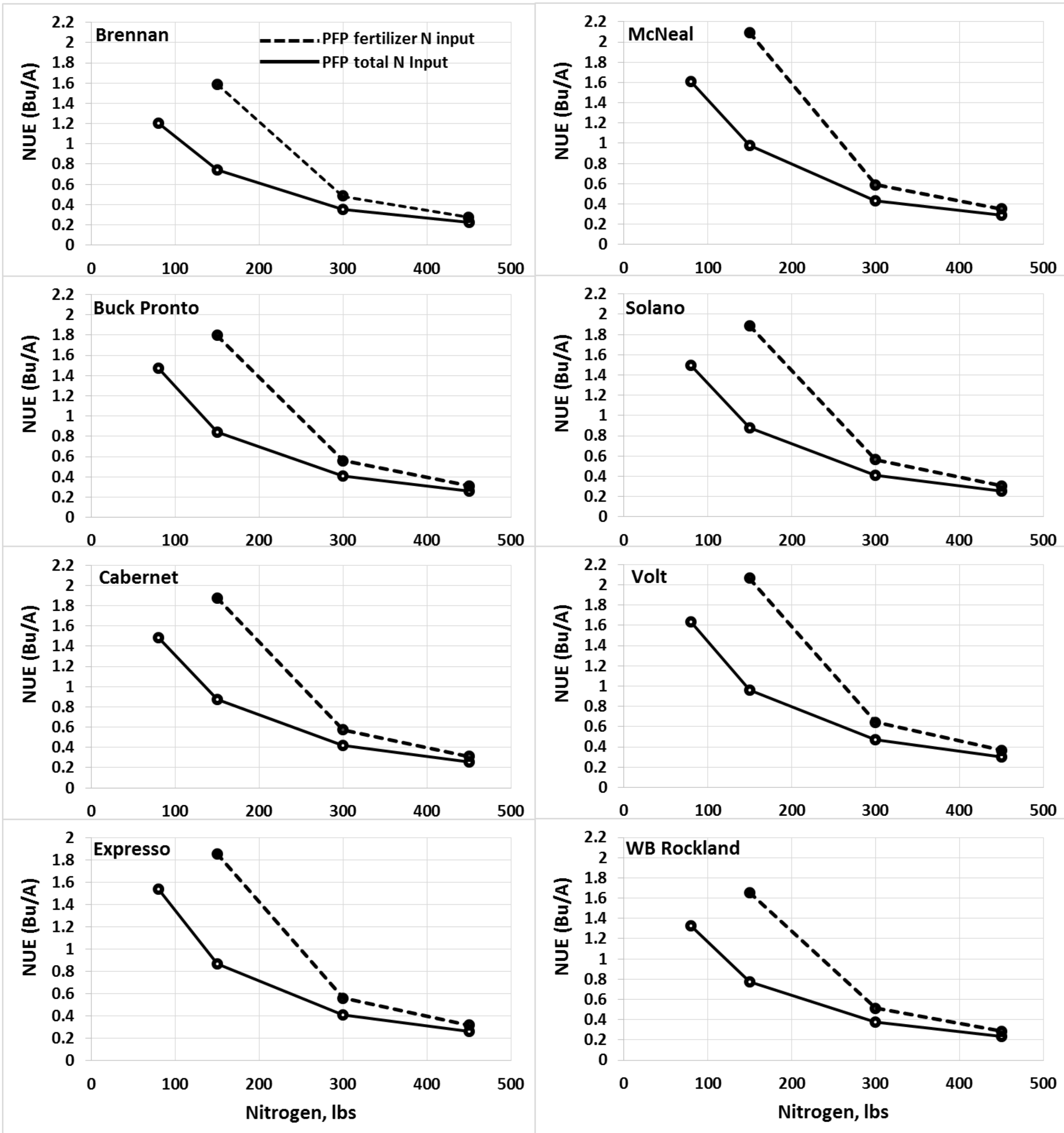


Figure 2. Nitrogen Partial Factor Productivity (PFP) of various spring wheat varieties



Project Title: Effects of Cerone and Lorsban Advanced on the Control of Orange Wheat Blossom Midge in Susceptible and Resistant Spring Wheat - 2014

Objective: To evaluate the interactive effects of applying Cerone and Lorsban Advanced on grain yield and quality in Orange Wheat Blossom Midge (OWBM) susceptible and resistant spring wheat cultivars.

Results:

This study was conducted to compare the treatment effects of Cerone and Lorsban Advanced when applied to Egan, a variety with OWBM resistance, and Solano, a non-resistant variety. The experimental design was a split-plot with the whole plot being Cerone and Lorsban Advanced treatments and the sub plot being variety. Treatments were replicated three times. Cerone treatments were applied at a rate of 0.75 pt/A, at flag leaf, on June 20th. Lorsban Advanced treatments were applied at a rate of 1pt/A, at 50% heading, on July 3rd.

The main effect of Cerone and Lorsban Advanced treatments had a significant effect on height, protein, and falling numbers (Table 2). Cerone applied alone or in combination with Lorsban Advanced, reduced plant height by 2.5 inches and decreased protein content.

Significant varietal differences were observed for the following response variables: OWBM larvae per spike, protein, test weight and thousand kernel weight. Egan provided complete control of OWBM larvae and was 1.5% higher in protein. Solano had greater test weight and thousand kernel weight values. Due to low OWBM populations this year, there were no significant difference in yield between varieties, regardless of the treatments applied.

Table 1. Materials and Methods - The effects of Cerone and Lorsban Advanced on the Control of the Orange Wheat Blossom Midge in Susceptible and Resistant Wheat - 2014

Seeding Date:	5/1/2014	Harvest Date:	8/29/2014
Julian Date:	121	Julian Date:	241
Seeding Rate:	80 lb/A	Soil Type:	Creston Sil
Previous Crop:	Fallow	Soil Test:	431-40-258
Tillage:	Conventional-Till	Fertilizer:	200-30-100
Irrigation:	N/A	Herbicide:	Huskie 11 floz/A and Axial XL 16.4 floz/A
		Fungicide:	Headline 9 floz/A

Table 2. Main effect of Cerone and Lorsban Advanced inputs on agronomic perfomance of spring wheat. 2014

Input	HD Julian	HT in	LOD %	OWBM no/spk	YLD bu/A	PRO %	TWT lb/bu	TKW g	FN sec
Check	184	37.8	7.7	4.1	109.9	15.9	60.3	35.8	449.8
Cerone	184	35.2	1.2	2.6	113.4	15.5	60.5	35.3	476.2
Lorsban Advanced	184	37.7	1.8	3.9	116.1	15.8	60.6	36.1	437.0
Cerone & Lorsban Advanced	184	35.2	1.2	3.9	114.9	15.4	60.6	35.0	451.5
LSD	ns	1.7	ns	ns	ns	0.4	ns	ns	ns
Pr>F	0.5035	0.0125	0.3911	0.3935	0.2863	0.0438	0.3376	0.4339	0.0542

Table 3. Main effect of cultivar on agronomic performance of spring wheat. 2014

Egan	184	36.7	3.0	0.0	113.9	16.4	60.3	33.5	455.0
Solano	184	36.3	2.9	7.2	113.2	14.9	60.7	37.6	452.3
LSD	ns	ns	ns	2.9	ns	0.1	0.1	1.0	ns
Pr>F	0.1869	0.4408	0.8434	0.0005	0.6852	0.0001	0.0001	0.0001	0.7455

Table 4. Effect of Cerone and Lorsban Advanced on spring wheat agronomic performance. 2014

				Egan					
Check	184	37.3	7.3	0.0	107.1	16.6	59.9	33.7	455.3
Cerone	185	35.7	1.3	0.0	115.7	16.2	60.3	33.5	479.3
Lorsban Advanced	184	38.3	1.7	0.0	117.6	16.6	60.5	34.1	434.3
Cerone & Lorsban Advanced	185	35.3	1.7	0.0	115.2	16.1	60.5	32.8	451.0
				Solano					
Check	184	38.3	8.0	8.2	112.7	15.2	60.7	37.8	444.3
Cerone	184	34.7	1.0	5.1	111.1	14.7	60.6	37.1	473.0
Lorsban Advanced	184	37.0	2.0	7.8	114.7	15.0	60.8	38.2	439.7
Cerone & Lorsban Advanced	184	35.0	0.7	7.8	114.5	14.7	60.8	37.1	452.0
LSD	ns	ns	ns	ns	ns	ns	0.1	ns	ns
Pr>F	0.8209	0.4377	0.5187	0.8181	0.1920	0.7522	0.0021	0.9547	0.8939

HD: heading, HT: height, LOD: lodging, OWBM: orange wheat blossom midge, YLD: yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, FN: falling number,
ns: nonsignificant.

Title: Effect of spring wheat resistance and insecticide application timing on the control of Orange Wheat Blossom Midge.

Objective: To identify the optimum application timing of insecticides for control of OWBM in susceptible and resistant spring wheat varieties.

Results:

Susceptible and resistant spring wheats incur feeding damage from the OWBM, and so both may benefit from insecticide applications. This study was conducted to determine the optimum insecticide application timing required to minimize damage from the wheat midge. The factorial treatment arrangement consisted of 2 spring wheat varieties, 3 insecticide treatments, and 4 application timings. The treatments were arranged as a split plot randomized complete block design where spring wheat varieties represented the main plot effect and insecticide-application timing combinations represented the sub plot effect. McNeal and Egan spring wheat were used to represent susceptible and resistant varieties, respectively. The three insecticides evaluated were a non-treated check, Warrior II, and Lorsban Advanced. The insecticides were applied at 30 heading, 70% heading, 30% anthesis, and 70% anthesis.

Overall midge pressure was considerably lower than previous years and no significant differences were observed for the main effects of insecticide and application timing, or the corresponding interaction (Tables 3-5).

Despite low OWBM larvae numbers, significant varietal differences were observed for all response variables except heading (Table 2). Egan was 0.8 inches taller, experienced 4.3% more lodging and had a 1.5% greater protein content than McNeal. McNeal produced higher yields and test weights than Egan.

Table 1. Materials and Methods - Effect of genetic resistance and insecticide application timing on the control of Orange Wheat Blossom Midge - 2014

Seeding Date:	5/1/2014	Harvest Date:	9/2/2014
Julian Date:	121	Julian Date:	245
Seeding Rate:	80 lb/A	Soil Type:	Creston Sil
Previous Crop:	Fallow	Soil Test:	431-40-258
Tillage:	Conventional-Till	Fertilizer:	200-30-100
Irrigation:	N/A	Herbicide:	Huskie 11 floz/A and Axial XL 16.4 floz/A
		Fungicide:	Headline 9 floz/A

Table 2. Main effect of genetic resistance with cultivars on the control of orange wheat blossom midge - 2014.

Cultivar	HD Julian	HT in	LOD %	OWBM no/spk	YLD bu/A	PRO %	TWT lb/bu
Egan	183	39.7	11.6	0.1	108.2	16.9	60.1
McNeal	183	38.9	7.3	1.6	113.7	15.4	60.8
LSD	ns	0.7	3.4	1.1	2.5	0.1	0.2
Pr>F	0.1313	0.0150	0.0158	0.0059	0.0001	0.0001	0.0001

Table 3. Main effect of insecticide variety on wheat resistance to orange wheat blossom midge - 2014.

Insecticide	HD Julian	HT in	LOD %	OWBM no/spk	YLD bu/A	PRO %	TWT lb/bu
Check	183	39.7	10.3	0.8	107.3	16.2	60.2
Warrior II	183	38.9	9.3	0.8	114.0	16.0	60.8
Lorsban Advanced	183	39.3	8.8	1.0	111.4	16.1	60.4
LSD	ns	ns	ns	ns	ns	ns	ns
Pr>F	0.2844	0.4870	0.7322	0.9475	0.4748	0.6751	0.2230

Table 4. Main effect of insecticide application timing on wheat for control of orange wheat blossom midge - 2014.

Timing	HD Julian	HT in	LOD %	OWBM no/spk	YLD bu/A	PRO %	TWT lb/bu
30% heading	183	39.6	8.6	1.4	113.1	16.2	60.5
70% heading	183	39.2	8.7	0.8	110	16.1	60.3
30% anthesis	183	39.2	10.2	0.3	110.5	16.1	60.5
70% anthesis	183	39.2	10.3	0.9	110.1	16.2	60.6
LSD	ns	ns	ns	ns	ns	ns	ns
Pr>F	0.5654	0.8085	0.7620	0.4232	0.5844	0.7289	0.7490

HD: heading, HT: height, LOD: lodging, OWBM: orange wheat blossom midge, YLD: yield, PRO: protein, TWT: test weight, ns: nonsignificant.

Table 5. Effect of genetic resistance , insecticide, and insecticide application timing on wheat resistance to orange wheat blossom midge - 2014.

	Heading (Julian)		Height (in)		Lodging (%)		OWBM (no/spk)		Yield (bu/A)		Protein (%)		TWT (lb/bu)	
	Egan	McNeal	Egan	McNeal	Egan	McNeal	Egan	McNeal	Egan	McNeal	Egan	McNeal	Egan	McNeal
	Check													
30% heading	183	183	40.0	40.0	16.7	1.3	0.0	1.2	108.4	117.8	16.9	15.4	59.9	60.8
70% heading	183	183	39.7	40.0	9.0	1.7	0.0	1.9	105.7	107.9	17.0	15.5	59.8	60.4
30% anthesis	183	183	39.0	39.7	11.0	12.3	0.0	0.6	101.5	108.0	16.8	15.5	59.7	60.3
70% anthesis	183	182	40.7	38.3	16.7	14.0	0.0	3.1	104.2	104.9	17.0	15.7	59.8	60.6
	Lorsban Advanced													
30% heading	182	182	39.7	39.0	4.0	5.7	0.0	4.0	106.6	114.5	16.8	15.6	60.2	60.4
70% heading	183	182	39.0	39.3	11.7	11.7	0.0	1.9	102.1	112.9	17.1	15.6	59.7	60.4
30% anthesis	183	183	40.3	38.3	10.0	13.3	0.0	0.9	115.6	113.5	16.9	15.5	60.3	60.9
70% anthesis	183	183	39.7	39.0	11.7	2.3	0.0	1.1	106.5	119.4	16.7	15.1	60.2	61.1
	Warrior II													
30% heading	183	183	40.0	39.0	13.3	10.7	1.1	2.2	113.2	118.2	17.0	15.3	60.5	61.2
70% heading	183	182	39.7	37.3	14.3	3.7	0.0	1.1	112.5	118.7	16.6	14.8	60.2	61.4
30% anthesis	183	183	39.0	38.7	7.3	7.3	0.0	0.6	110.2	114.4	16.5	15.1	60.5	61.0
70% anthesis	183	183	39.7	37.7	13.3	4.0	0.0	1.2	111.7	113.6	17.0	15.5	60.5	61.2
LSD	ns		ns		ns		ns		ns		ns		ns	
Pr>F	0.9621		0.3873		0.4550		0.9114		0.2136		0.4800		0.4503	

OWBM: orange wheat blossom midge, TWT: test weight, ns: nonsignificant.

Title: Insecticide application timing for Orange Wheat Blossom Midge control.

Objective: To evaluate the efficacy and optimum application timing of insecticides for the control of OWBM in spring wheat.

Report:

Proper insecticide application timing is considered an important factor in the management of the Orange Wheat Blossom Midge. This study was conducted to evaluate the efficacy of five insecticides when applied at three different timings. The timings included early tiller, 50% flowering and 50% anthesis. The early tiller treatments were included to assess the efficacy of soil applied treatment, and were timed to coincide with an early season herbicide application (Zadoks 22, two tillering). The insecticides evaluated included AgriTrap, Fastac, Lorsban Advanced, Aza-Direct and Warrior II. A non-treated control was also included.

Due to uncommonly low OWBM pressure this year, no significant differences were observed for midge control, yield or grain quality. However, significant differences were observed for crop injury. Lorsban Advanced resulted in 30 % crop injury when applied to early tillered wheat. However, the crop eventually recovered, and no effect on yield could be detected.

Table 1. Materials and Methods - Insecticide application timing for Orange Wheat Blossom Midge control - 2014.

Seeding Date:	5/3/2014	Harvest Date:	9/6/2014
Julian Date:	123	Julian Date:	249
Seeding Rate:	110 lb/A	Soil Type:	Creston Sil
Previous Crop:	Fallow	Soil Test:	431-40-258
Tillage:	Conventional-Till	Fertilizer:	200-30-100
Irrigation:	N/A	Herbicide:	Huskie 11 floz/A and Axial XL 16.4 floz/A
		Fungicide:	Headline 9 floz/A

Table 2. Main effect of insecticide on Orange Wheat Blossom Midge control in spring wheat - 2014.

Insecticide	CI %	HD Julian	HT in	LOD %	OWBM no/spk	YLD bu/A	PRO %	TWT lb/bu
Check	0.0	178	34.9	15.0	0.1	115.4	14.4	56.8
AgriTrap Foliar	0.0	178	35.6	11.4	0.1	112.5	14.3	57.0
Fastac	0.0	178	35.3	13.4	0.2	111.1	14.1	57.7
Lorsban Advanced	10.6	178	35.3	17.2	0.3	115.5	14.2	57.5
Aza-Direct	0.0	178	35.1	16.1	0.3	111.1	14.2	57.3
Warrior II	0.0	178	35.1	13.4	0.2	123.3	14.1	57.8
LSD	0.7	ns	ns	ns	ns	ns	ns	ns
Pr>F	0.0001	0.6812	0.6704	0.2309	0.8786	0.3096	0.4143	0.1147

Table 3. Main effect of application timing on Orange Wheat Blossom Midge control in spring wheat - 2014.

Timing	CI %	HD Julian	HT in	LOD %	OWBM no/spk	YLD bu/A	PRO %	TWT lb/bu
Early tiller	5.3	178	35.4	18.4	0.2	110.6	14.3	56.9
50% heading	0.0	178	34.9	16.8	0.3	116.7	14.2	57.6
50% anthesis	0.0	178	35.3	8.2	0.0	117.2	14.2	57.6
LSD	0.6	ns	ns	ns	ns	ns	ns	ns
Pr>F	0.0001	0.4082	0.5575	0.5171	0.1394	0.2561	0.4827	0.3518

CI: crop injury, HD: heading, HT: height, LOD: lodging, OWBM: orange wheat blossom midge, YLD: yield, PRO: protein, TWT: test weight, ns: not significant

Table 4. Effect of insecticide and timing on Orange Wheat Blossom Midge control in spring wheat - 2014.

Insecticide	CI %	HD Julian	HT in	LOD %	OWBM avg.	YLD bu/A	PRO %	TWT lb/bu
Early tiller								
AgriTrap Foliar	0.0	178	36.0	27.3	0.0	95.6	14.6	56.3
Fastac	0.0	178	36.0	36.0	0.7	104.6	14.3	57.0
Lorsban Advanced	31.7	178	35.7	3.0	0.4	116.8	14.1	57.4
Aza-Direct	0.0	178	34.3	13.3	0.0	103.7	14.3	57.2
Warrior II	0.0	178	35.0	3.3	0.2	126.2	14.2	57.4
50% heading								
Check	0.0	178	34.7	13.0	0.2	117.7	14.2	57.2
AgriTrap Foliar	0.0	178	35.7	1.7	0.2	119.2	14.2	57.4
Fastac	0.0	178	34.7	1.3	0.0	113.2	14.0	58.0
Lorsban Advanced	0.0	178	34.7	30.7	0.3	117.5	14.3	57.5
Aza-Direct	0.0	178	35.3	26.7	1.0	111.6	14.2	57.3
Warrior II	0.0	178	34.7	27.3	0.2	121.0	14.1	58.4
50% anthesis								
Check	0.0	178	34.7	4.7	0.0	111.9	14.2	57.2
AgriTrap Foliar	0.0	178	35.0	5.3	0.0	122.7	14.2	57.4
Fastac	0.0	177	35.3	3.0	0.0	115.5	14.1	58.0
Lorsban Advanced	0.0	177	35.7	18.0	0.1	112.1	14.2	57.7
Aza-Direct	0.0	178	35.7	8.3	0.0	118.1	14.2	57.6
Warrior II	0.0	178	35.7	9.7	0.0	122.7	14.2	57.7
LSD	1.2	ns	ns	ns	ns	ns	ns	ns
Pr>F	0.0001	0.2127	0.1164	0.2533	0.5217	0.4774	0.7798	0.9790

CI: crop injury, HD: heading, HT: height, LOD: lodging, OWBM: orange wheat blossom midge, YLD: yield, PRO: protein, TWT: test weight, ns: not significant

Project Title: On-Farm Comparison of Varietal Preference to Egg-laying by Orange Wheat Blossom Midge.

Project Participants: Heritage Custom Farming, Chris Fritz, Karl Schrade, and NWARC staff.

Objective: To compare the attractiveness of two commercially available spring wheat varieties for egg-laying preference by the OWBM.

Results:

Previous studies conducted at NWARC have demonstrated that certain spring wheat varieties attract the adult egg-laying wheat midge, while other varieties deter egg-laying. To test this apparent preference trend under a field scale basis, Reeder (non-attractive) and Solano (attractive), were seeded at four on-farm locations in Flathead County. Field size ranged from 5 to 10 acres per variety. The locations selected had a previous history of substantial OWBM pressure.

Fields were seeded at 100 lb/A (Reeder) and 135 lb/A (Solano) to achieve a target population of 35 plants per square foot. Planting was delayed until approximately May 1, to insure that heading coincided with peak oviposition (Table 1).

Reeder, a taller variety and therefore prone to lodging, was treated with Palisade, a plant growth regulator, at jointing to all fields except the Schrade and Fritz locations. The insecticide, Warrior II, was applied if OWBM populations reached economic threshold levels and the wheat crop was at the vulnerable growth stage of 50% heading through 70% anthesis (Table 1).

Adult midge peak emergence time varied across the four locations. The peak population at Heritage Custom Farming (HCF) occurred during the last week of June compared to the middle of July at Schrade's. The midge emergence at HCF occurred while the crop was susceptible which resulted in the need for an insecticide application. However, peak emergence at Schrade's occurred after the vulnerable stage and no insecticide treatment was warranted.

Despite the variation in midge populations and insecticide usage across locations, no significant difference was observed in yield, general grain quality or number of OWBM per spike (Table 2). This highlights the importance of crop staging in determining the need to treat for OWBM.

Statistically there was no difference in the number of OWBM per spike regardless of variety. This is contradictory to what has been observed in the small plot research conducted at NWARC. These results emphasize the importance of scaling-up experiments in order to validate preliminary research findings.

Table 1. Cultural data for the on-farm comparision of varietal preference to egg-laying by OWBM 2014

Location	Seeding Date	Harvest Date	Palisade	Insecticide	OWBM Peak Emergence #/ trap	OWBM Peak Emergence Date
HCF	5/13	9/13	NA	7/10	3015	6/24-7/1
Fritz	5/5	9/19	NA	7/9	219	7/1-7/8
NWARC	5/13	9/8	6/23	NA	213	7/5
Schrade	4/29	9/5	NA	NA	2553	7/10-7/17

Table 2. Agronomic data from the on-farm comparison of varietal preference to egg-laying by OWBM- 2014.

	Plant /sqft		BioMass /sqft		Height inches		Yield bu/A		Protein %	
Location	Reeder	Solano	Reeder	Solano	Reeder	Solano	Reeder	Solano	Reeder	Solano
NWARC	43.8	30.4	20.2	17.5	34.6	28.5	72.5	59.4	14.9	13.4
HCF	15.4	14.2	30.0	21.9	26.9	22.6	37.6	53.6	16.4	16.4
Fritz	24.7	17.5	20.9	19.1	33.9	27.0	60.9	83.3	15.4	13.7
Schrade	22.6	22.6	29.3	26.7	35.9	27.9	76.3	74.9	11.8	12.3
Mean	26.6	21.2	25.1	21.3	32.8	26.5	61.8	67.8	14.6	13.9
CV	18.2		8.8		3.7		17.7		5.4	
LSD	ns		ns		2.5		ns		ns	
Pr>F	0.1752		0.0786		0.0039		0.5145		0.3038	

Table 2. continued

	Test Weight lb/bu		TKW g		FNa seconds		FNb seconds		OWBM number/spike	
Location	Reeder	Solano	Reeder	Solano	Reeder	Solano	Reeder	Solano	Reeder	Solano
NWARC	58.6	57.6	34.4	34.9	180.1	218.4	205.0	321.0	1.6	10.2
HCF	54.7	53.2	28.6	29.8	460.0	337.0	423.0	404.0	6.8	25.8
Fritz	52.5	53.6	25.8	30.4	397.1	383.6	.	.	0.0	4.8
Schrade	57.5	57.2	32.2	37.8	399.8	360.7	447.0	411.0	0.0	0.0
Mean	55.8	55.4	30.3	33.2	359.2	324.9	358.3	378.7	2.1	10.2
CV	1.4		5.6		8.6		16.0		92.8	
LSD	ns		ns		ns		ns		ns	
Pr>F	0.5086		0.0979		0.8499		0.7135		0.1385	

Fna: falling number tested at NWARC, FNb: falling number tested at the National Quality Inspection Lab, TKW: thousand kernal weight, OWBM: orange wheat blossom midge
ns: non-significant

Project Title: Sm1 Interspersed Refuge Evaluation – 2014

Project Personnel: Bob Stougaard, Brooke Bohannon, Luther Talbert and Nancy Blake

Objective: To evaluate the efficacy and agronomic performance of the interspersed refuge system.

Results:

The purpose of the interspersed refuge system is to delay the selection of virulent, Sm1 resistant, midge populations. The refuge, or susceptible variety, is blended with the midge resistant variety at a ratio of 1:9. The combination is then planted together in an effort to maintain the genetic diversity of the midge population.

In this study, CAP 34-1 and Egan (formally CAP 400-1) contain the Sm1 gene for OWBM resistance, while Solano and Choteau are midge susceptible varieties. These four cultivars were planted alone and as blends (Table 2), where the midge resistant cultivars comprised 90% of the blended mixture.

Differences were detected in the number of OWBM larvae per spike. Solano had the greatest level of infestation. The Sm1 resistant cultivars, as a single variety or in the refuge system, afforded 88% to 100% midge larvae mortality. However, no differences in yield were observed due to low insect populations.

Table 1. Materials and Methods - Sm1 Interspersed Refuge Evaluation - 2014

Seeding Date:	5/1/2014	Harvest Date:	8/29/2014
Julian Date:	121	Julian Date:	241
Seeding Rate:	80 lb/A	Soil Type:	Creston Sil
Previous Crop:	Fallow	Soil Test:	431-40-258
Tillage:	Conventional-Till	Fertilizer:	200-30-100
Irrigation:	N/A	Herbicide:	Huskie 11 floz/A and Axial XL 16.4 floz/A
		Fungicide:	Headline 9 floz/A

Table 2. Agronomic data for the efficacy of the Sm1 interspersed refuge system - 2014.

Treatment	HD Julian	HT in	LOD %	YLD bu/A	PRO %	TWT %	OWBM no/spk	TKW g
SOLANO	183	27.7	2.7	120.2	15.4	60.8	5.7	38.0
CHOTEAU	181	35.7	3.7	109.2	15.0	60.4	1.4	35.6
CAP 34-1	180	34.3	3.3	118.9	14.2	60.9	0.0	36.2
EGAN	184	36.0	4.0	108.7	16.5	59.9	0.2	34.5
CAP 34-1 & SOLANO	180	33.7	3.0	121.5	14.4	61.2	0.0	35.8
CAP 34-1 & CHOTEAU	181	33.3	3.0	108.9	14.4	61.3	0.7	36.0
EGAN & SOLANO	184	36.7	1.3	111.6	16.5	60.1	0.2	34.2
EGAN & CHOTEAU	184	37.3	3.7	111.8	16.5	60.1	0.4	35.1
Mean	182	34.3	3.1	113.9	15.4	60.6	1.1	35.7
CV	0.5	4.8	50.0	5.6	1.7	0.5	160.9	4.4
LSD	1.4	2.9	ns	ns	0.4	0.5	3.0	ns
Pr>F	0.0001	0.0001	0.5511	0.1000	0.0001	0.0003	0.0193	0.1831

HD: heading, HT: height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight, OBMW: orange wheat blossom midge, TKW: thousand kernel weight, MC: moisture content, ns:nonsignificant.

Title: Spring Wheat Cultivar Response to Insecticide and Fungicide Applications - 2014

Objective: To determine the response of commercial spring wheat varieties to insecticide and fungicide inputs.

Results:

Stripe rust and the Orange Wheat Blossom Midge (OWBM) are two pests in spring wheat which have a negative impact on grain yield and quality. This study was conducted to evaluate the level of plant resistance present in common spring wheat varieties, and to determine the agronomic response of these materials when treated for the control of both pests. Sixteen varieties were planted as a split plot, randomized complete block design. The main-plot was pesticide treatment and the sub-plot was variety. Headline was applied on June 20th at flag leaf for the control of stripe rust, and Lorsban Advanced was applied on June 30th at heading, for control of the OWBM.

Orange Wheat Blossom Midge pressure was uncommonly low this year. The average number of larvae per spike, regardless of treatment, was 0.4 this year compared to 9.0 in 2013. Similarly, stripe rust pressure also was low this year. Stripe rust infection only averaged 5.7% in the non-treated check varieties compared to 31.7% infection in 2013. Despite the low level of stripe rust infection, significant differences where observed among varieties. Duclair, Oneal and Hank were most susceptible, having infection levels above 15 percent. The effect of fungicide input treatment was significant for Hank and Oneal, but had no impact on Duclair. Pesticide inputs impacted thousand kernel weights. On average, TKW's were 38.8 and 40.1 for non-treated and treated varieties, with Hank and Corbin showing the greatest benefit.

The lack of pest pressure resulted in excellent yields and grain quality. Yields averaged 109.2 bu/A with Cabernet, Duclair, Vida and Volt producing yields in excess of 114 bu/A. Protein averaged 14.7 percent, with Egan having the highest protein at 16.2 percent and Volt the lowest at 13.8 percent. There were no differences among varieties for test weight, which averaged 59.9 lb/bu. Falling number averaged 308.6 seconds, and ranged from a low of 216.7 for Vida to a high of 398.1 for McNeal.

Overall, low pest pressure prevented an assessment of varietal differences to stripe rust and OWBM and negated any benefit associated with either insecticide or fungicide treatment.

Table 1. Materials and Methods - Spring Wheat Cultivar Response to Insecticide and Fungicide Applications - 2014.

Seeding Date:	4/30/2014	Harvest Date:	9/8/2014
Julian Date:	120	Julian Date:	251
Seeding Rate:	80 lb/A	Soil Type:	Creston Sil
Previous Crop:	Alfalfa	Soil Test:	163-14-138
Tillage:	Conventional	Fertilizer:	200-30-100
Irrigation:	None	Herbicide:	Huskie 11 floz/A and Axial XL 16.4 floz/A

Table 2. Agronomic response of spring wheat varieties to fungicide and insecticide inputs. Kalispell, 2014.

	Heading (Julian)			Height (in)			Lodging (%)			Stripe rust (%) July 23		
Cultivar	check	treated	avg.	check	treated	avg.	check	treated	avg.	check	treated	avg.
Brennan	177	177	177	33.3	32.3	32.8	0.0	0.0	0.0	1.3	0.0	0.7
Buckpronto	176	175	176	34.7	36.0	35.3	0.0	0.0	0.0	6.0	6.7	6.3
Cabernet	178	178	178	31.0	29.0	30.0	0.0	0.7	0.3	4.7	3.3	4.0
Choteau	179	178	179	35.0	35.0	35.0	0.0	0.0	0.0	6.0	6.7	6.3
Corbin	178	178	178	36.3	35.3	35.8	5.0	0.0	2.5	3.3	4.3	3.8
Duclair	177	177	177	38.3	35.7	37.0	3.3	0.0	1.7	16.3	13.7	15.0
Egan	183	182	183	36.3	36.0	36.2	0.0	0.0	0.0	2.0	1.3	1.7
Hank	177	176	177	35.7	30.7	33.2	0.0	1.3	0.7	15.7	4.3	10.0
McNeal	182	183	183	35.0	38.0	36.5	0.0	0.7	0.3	3.0	1.0	2.0
Mott	184	183	183	40.0	42.0	41.0	0.0	1.3	0.7	8.3	1.7	5.0
Oneal	182	181	182	37.0	35.7	36.3	3.3	0.0	1.7	18.0	7.7	12.8
Reeder	178	180	179	37.0	38.7	37.8	0.0	0.0	0.0	2.7	1.3	2.0
Solano	180	178	179	33.0	30.3	31.7	0.0	1.0	0.5	2.7	2.3	2.5
SY Tyra	178	179	179	34.0	33.0	33.5	0.0	0.0	0.0	0.0	0.7	0.3
Vida	182	180	181	35.7	36.7	36.2	0.0	0.0	0.0	0.0	3.0	1.5
Volt	184	184	184	34.7	35.3	35.0	0.0	0.0	0.0	1.7	4.0	2.8
Mean	180	179	179	35.4	35.0	35.2	0.7	0.3	0.5	5.7	3.9	4.8
LSD	ns		1.1	ns		3.0	ns		ns	4.6		3.3
Pr>F	0.0945		0.0001	0.5350		0.0001	0.4262		0.7363	0.0007		0.0001

ns: non-significant

Table 2. continued

Cultivar	Septoria (%)			Yield (bu/A)			Protein (%)			Test weight (lb/bu)		
	check	treated	avg.	check	treated	avg.	check	treated	avg.	check	treated	avg.
Brennan	33.3	28.3	30.8	98.4	100.6	99.5	15.1	15.3	15.2	59.9	60.1	60.0
Buckpronto	55.0	26.7	40.8	103.9	96.0	100.0	15.2	15.1	15.2	59.2	60.4	59.8
Cabernet	61.7	36.7	49.2	114.3	116.4	115.3	14.2	14.3	14.3	58.9	59.6	59.3
Choteau	56.7	28.3	42.5	106.5	110.0	108.2	14.9	14.7	14.8	59.6	60.4	60.0
Corbin	35.0	6.7	20.8	105.9	104.7	105.3	14.6	14.6	14.6	60.2	60.8	60.5
Duclair	51.7	17.7	34.7	117.9	110.4	114.1	14.7	14.7	14.7	59.0	59.2	59.1
Egan	40.0	36.7	38.3	111.8	106.9	109.3	16.1	16.4	16.2	60.1	60.4	60.3
Hank	40.0	15.0	27.5	103.8	115.8	109.8	14.1	14.4	14.2	58.3	59.6	59.0
McNeal	25.0	21.7	23.3	103.0	110.8	106.9	14.9	14.9	14.9	60.1	61.0	60.6
Mott	33.3	25.0	29.2	105.0	116.7	110.9	14.1	14.6	14.3	59.5	60.1	59.8
Oneal	28.3	6.0	17.2	96.1	108.6	102.3	14.4	14.9	14.7	59.8	60.5	60.1
Reeder	16.7	3.3	10.0	114.1	110.6	112.3	14.7	15.0	14.9	60.6	60.9	60.7
Solano	40.0	11.7	25.8	106.1	100.2	103.1	15.2	15.0	15.1	59.4	59.9	59.6
SY Tyra	38.3	11.7	25.0	104.9	108.9	106.9	14.3	14.3	14.3	59.6	60.7	60.2
Vida	21.7	7.7	14.7	124.5	117.6	121.0	14.9	14.6	14.7	59.1	60.2	59.6
Volt	27.7	11.3	19.5	119.3	124.3	121.8	13.8	13.7	13.8	61.2	58.8	60.0
Mean	37.8	18.4	28.1	108.5	109.9	109.2	14.7	14.8	14.7	59.7	60.2	59.9
LSD	ns		17.4	ns		8.5	ns		0.4	ns		ns
Pr>F	0.7787		0.0009	0.1707		0.0001	0.5975		0.0001	0.4857		0.1978

ns: non-significant

Table 2. continued

Cultivar	TKW (g) check	TKW (g) treated	TKW (g) avg.	Falling number (sec) check	Falling number (sec) treated	Falling number (sec) avg.	OWBM (no/spike) check	OWBM (no/spike) treated	OWBM (no/spike) avg.
Brennan	35.8	37.7	36.8	258.7	258.4	258.5	0.3	0.0	0.2
Buckpronto	43.2	45.2	44.2	345.1	364.9	355.0	0.1	0.2	0.2
Cabernet	41.5	39.9	40.7	326.8	329.9	328.3	0.0	0.1	0.1
Choteau	36.7	38.4	37.6	287.7	331.5	309.6	0.4	0.1	0.3
Corbin	42.7	47.9	45.3	288.7	344.4	316.6	0.0	0.1	0.1
Duclair	38.0	38.8	38.4	230.5	279.1	254.8	0.1	0.0	0.1
Egan	36.0	37.2	36.6	377.5	371.2	374.4	0.2	0.0	0.1
Hank	42.1	47.5	44.8	289.6	314.1	301.8	0.3	0.2	0.3
McNeal	39.4	40.5	40.0	370.3	426.0	398.1	2.8	0.0	1.4
Mott	33.8	35.0	34.4	295.9	290.4	293.2	1.6	0.3	0.9
Oneal	35.4	38.4	36.9	344.9	372.2	358.6	1.4	0.4	0.9
Reeder	41.8	39.0	40.4	306.1	343.1	324.6	0.0	0.0	0.0
Solano	43.3	41.7	42.5	239.0	280.3	259.7	2.1	0.0	1.1
SY Tyra	36.2	39.0	37.6	210.2	228.2	219.2	0.8	0.0	0.4
Vida	37.8	38.9	38.3	176.6	256.7	216.7	0.4	0.0	0.2
Volt	36.7	36.8	36.8	350.2	387.0	368.6	0.3	0.4	0.4
Mean	38.8	40.1	39.4	293.6	323.6	308.6	0.7	0.1	0.4
LSD	3.1		2.2	ns		27.4	ns		ns
Pr>F	0.0276		0.0001	0.0971		0.0001	0.4628		0.4333

TKW: thousand kernel weight, OWBM: orange wheat blossom midge (number per spike), ns: non-significant

Project Title:	Evaluation of water use efficiency of spring wheat on fine sandy loam
Project Leaders:	Jessica Torrion (PI), Bob Stougaard (Co-PI)
Project Personnel:	John Garner, Brooke Bohannon
Objective:	To evaluate water use response of spring wheat varieties on yield and quality

Methods:

Eight spring wheat cultivars were grown under six irrigation levels as a split plot, randomized complete block design with four replications, where irrigation levels represent the whole plot and the eight spring wheat varieties were the sub plot factor. The irrigation levels included full irrigation (FullIrr), deficit irrigation (2/3FullIrr), various levels of early irrigation termination events (FullIrr-1, FullIrr-2 FullIrr-3) and a rain-fed check. The daily potential evapotranspiration was monitored (Creston Weather Station) and daily crop water use was determined using a crop coefficient approach. To trigger irrigation, daily soil water balance was calculated and plant water availability was maintained above 50% in treatment FullIrr. The amount and timing of irrigation for each treatment is shown in Figure 1 and details of agronomic management in Table 1.

Figure 1. Rainfall events, irrigation application amount and timing of application

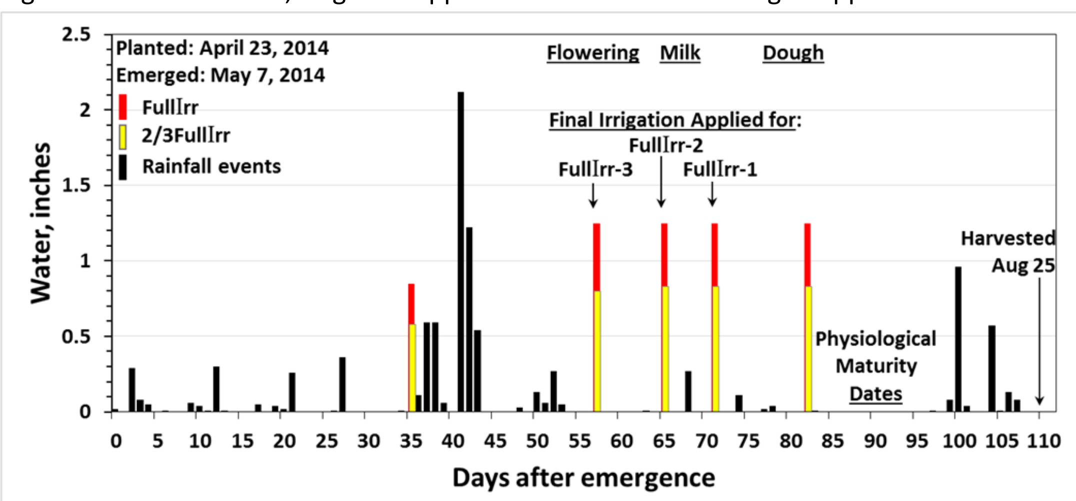


Table 1: Material and Methods - Water use efficiency in spring wheat - 2014

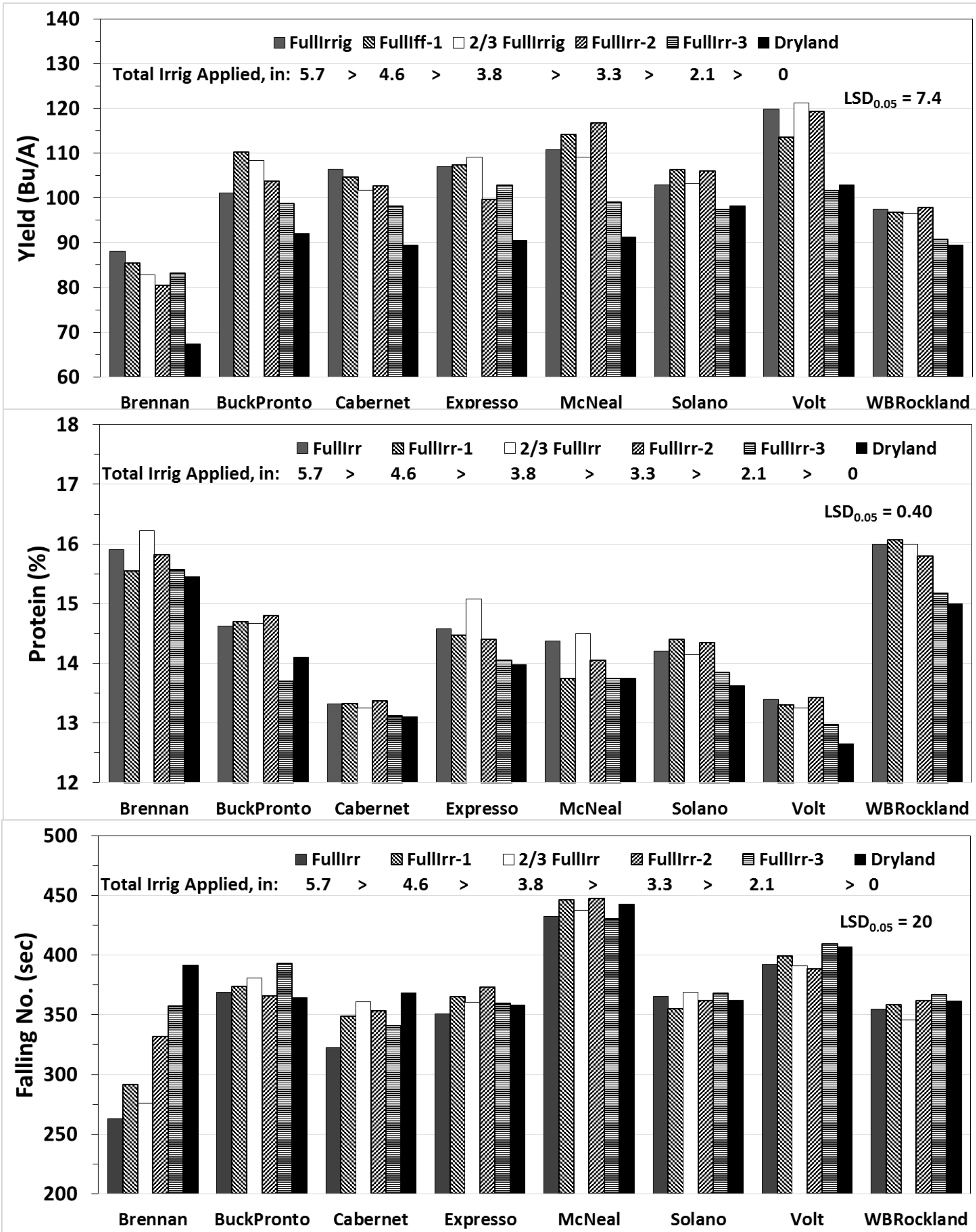
Seeding Date:	4/23/14	Herbicide:	5/30/14
Julian Date:	113		Huskie 11 floz/ac, Axial XL 16.4 floz/ac
Seeding Rate:	20 plnts/sqft	Insecticide:	7/1/14
Previous Crop:	Canola		Warrior II 1.5 floz/ac
Tillage:	Conventional	Fungicide:	7/1/2014
Irrigation:	Yes		Headline 7 floz/ac
Soil Type:	Fine sandy loam	Harvest Date:	8/26/14
Soil Test:	120-14-69	Julian Date:	238
Fertilizer:	200-30-100		

Table 2. Spring wheat water use effects on agronomic performance — 2014

Cultivar	HT in	PM* days	SS seeds/lb	MC %	YLD bu/A	PRO %	TWT lb/bu	TKW g	FN sec
Full Irrigation (FullIrrig)									
Brennan	29.1	94	11,411	13.0	88.2	15.9	60.4	39.8	263
Buck Pronto	29.5	96	9,410	13.9	101.1	14.6	60.2	48.2	369
Cabernet	25.4	94	11,070	12.5	106.4	13.3	59.9	41.0	323
Expresso	27.4	98	10,929	13.4	107.0	14.6	60.9	41.6	351
McNeal	32.4	96	10,061	14.2	110.8	14.4	60.9	45.1	433
Solano	24.8	96	10,498	13.2	102.9	14.2	60.8	43.2	365
Volt	28.7	97	11,834	13.9	119.9	13.4	62.5	38.4	392
WB Rockland	25.1	97	10,552	12.8	97.5	16.0	60.3	43.1	355
Deficit Irrigation (2/3FullIrrig)									
Brennan	27.1	93	11,439	12.8	82.8	16.2	60.3	39.7	276
Buck Pronto	28.2	94	9,615	13.8	108.4	14.7	60.2	47.2	381
Cabernet	25.2	92	11,341	12.5	101.7	13.3	59.5	40.0	361
Expresso	27.9	97	11,777	13.4	109.1	15.1	61.0	39.2	360
McNeal	31.5	94	10,262	14.2	109.1	14.5	60.8	44.2	438
Solano	25.1	96	10,735	13.1	103.3	14.2	60.9	42.3	369
Volt	30.3	96	11,779	13.8	121.2	13.3	62.5	38.5	391
WB Rockland	23.9	97	10,458	12.9	96.6	16.0	60.2	43.4	346
One Irrigation Event terminated Early (FullIrrig-1)									
Brennan	26.5	92	11,679	12.7	85.5	15.6	60.7	38.9	292
Buck Pronto	30.1	94	9,514	13.9	110.2	14.7	60.3	47.7	374
Cabernet	25.3	92	11,246	12.5	104.7	13.3	59.5	40.4	349
Expresso	26.0	94	11,216	13.1	107.3	14.5	60.7	40.5	365
McNeal	31.5	94	10,195	14.1	114.2	13.8	60.9	44.6	446
Solano	24.4	94	10,847	13.3	106.3	14.4	60.4	42.0	355
Volt	29.5	95	12,360	13.8	113.6	13.3	62.3	36.8	399
WBRockla	24.5	97	10,497	12.7	96.8	16.1	60.2	43.3	358
Two Irrigation Events Terminated Early (FullIrrig-2)									
Brennan	25.8	89	11,475	12.7	80.5	15.8	60.6	39.6	332
Buck Pronto	29.6	92	9,958	13.8	103.7	14.8	60.0	45.7	366
Cabernet	24.3	91	11,442	12.5	102.6	13.4	59.3	39.7	353
Expresso	25.3	93	11,549	13.0	99.7	14.4	60.3	39.3	373
McNeal	31.3	93	10,309	14.0	116.7	14.1	61.0	44.0	447
Solano	25.6	95	11,035	13.0	106.0	14.4	60.4	41.2	362
Volt	31.6	94	12,378	13.8	119.2	13.4	62.2	36.7	388
WB Rockland	25.2	95	10,778	12.6	97.8	15.8	60.2	42.2	362
Three Irrigation Events Terminated Early (FullIrrig-3)									
Brennan	25.93	86	12,039	13.0	83.2	15.6	60.5	37.8	357
Buck Pronto	30.30	88	10,700	13.6	98.8	13.7	60.0	42.9	393
Cabernet	26.18	88	11,829	12.7	98.1	13.1	58.9	38.4	341
Expresso	25.95	94	11,752	13.1	102.8	14.1	60.4	38.6	359
McNeal	33.85	89	10,976	14.1	99.1	13.8	60.1	41.4	430
Solano	25.25	91	11,302	13.1	97.3	13.9	59.8	40.2	368
Volt	30.80	92	12,214	13.6	101.7	13.0	60.8	37.5	410
WB Rockland	24.05	93	11,194	12.8	90.8	15.2	59.8	40.6	367
Dryland									
Brennan	24.2	83	12,571	12.7	67.4	15.5	60.2	36.2	392
Buck Pronto	30.2	88	10,289	13.7	92.1	14.1	59.6	44.2	364
Cabernet	24.8	85	12,395	12.3	89.5	13.1	58.8	36.7	369
Expresso	26.2	90	11,950	12.8	90.6	14.0	59.8	38.1	358
McNeal	31.6	87	11,494	14.2	91.3	13.8	59.6	39.6	443
Solano	26.7	90	11,536	13.0	98.2	13.6	59.8	39.4	362
Volt	30.5	90	13,231	13.4	103.0	12.7	61.5	34.4	407
WB Rockland	25.2	91	11,297	12.6	89.5	15.0	59.8	40.3	362
C.V	12.0	5.0	8.7	4.8	15.2	7.3	1.6	8.6	12.4
LSD	1.6	3.2	417.0	0.7	7.4	0.4	0.5	1.4	20.0
$Pr>F_{(0.05)-Irr}$	0.758	<0.0001	<0.0001	0.417	<0.0001	<0.0001	<0.0001	<0.0001	0.009
$Pr>F_{(0.05)-Var}$	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
$Pr>F_{(0.05)-Irr x Var}$	0.3918	0.9882	0.8800	0.0330	0.7321	0.4700	0.0020	0.8342	0.0003

HT: height, PM: physiological maturity *(duration from emergence), SS: seed size, MC: moisture content, YLD: yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, FN: falling number.

Figure 2. Yield, protein and falling number responses to water treatments



Summary:

The main effect of irrigation was significant for yield, protein, physiological maturity, and seed size. Volt responded the most in terms of yield whereas Brennan responded the least. The expected relationship between yield and protein was observed. Brennan had the highest protein whereas Volt had the least. Except Cabernet, an increase in protein was observed when irrigation was triggered during milk to soft dough stage indicating increased soil N uptake for enhanced protein. Irrigation did not impact plant height and no visible plant lodging was observed.

There was a significant interaction between irrigation and variety on falling number and test weight. Test weight for Cabernet was sensitive to drought (dryland) with only 58.7 lbs/bu and increased with supplemental irrigation. Test weight for Volt was the highest under dryland conditions, and increased further as supplemental irrigation was increased. Except for Brennan, most of the varieties showed resistance to preharvest sprout (PHS) with falling numbers greater than 300 FN. However, FN values tended to decrease with increased irrigation. Brennan was the most susceptible to PHS, with FN values dramatically decreasing with increased irrigation. Chances of PHS in Brennan is high (FN lower than 300) when irrigation was applied at milk or dough stage.

Project Title: Evaluation of Advanced Spring Wheat Experimental Lines – 2014

Objective: To evaluate spring wheat varieties and experimental lines for agronomic performance in environments and cropping systems representative of northwestern Montana.

Results:

Heading dates averaged 178 Julian days (June 27) and spanned a 9 day period that ranged from 175 to 184 days. Stripe rust averaged 6.9% and was observed on all cultivars except for Egan, MT 1276, and MT 1331. Jedd was the most susceptible cultivar to stripe rust at 52.7% infection. Plant heights averaged 34.9 inches and ranged from 27.7 inches for Jedd to 49.0 inches for Thatcher. Lodging was minimal this year with an average of 1.0% and was observed in 15 of the 64 cultivars. Thatcher, the tallest cultivar, had the highest degree of lodging at 15.0%. Yields averaged 107.2 bu/A and ranged from 85.8 bu/A for Jedd to 130.8 bu/A for LIMAGR143. The highest yielding commercially available cultivar was McNeal at 121.9 bu/A. Protein content averaged 14.2% and ranged from 12.7% for LIMAGR142 to 15.8% for MT 1360. Test weights averaged 59.8 lb/bu and ranged from 54.4 lb/bu for MT1228 to 61.8 lb/bu for WB144 and WB Gunnison. Cultivars varied in susceptibility to the herbicide treatment. Crop injury averaged 14.0% and ranged from 6.0% for MT 1234 to 40.8% for both WB Gunnison and Buckpronto. Septoria infection was low affecting 3 of the 64 cultivars.

Summary:

The 2014 growing season had low pressure from insects and diseases, which resulted in high yields.

Table 1. Materials and Methods - Evaluation of Advanced Spring Wheat Experimental Lines - 2014

Seeding Date:	4/30/2014	Harvest Date:	9/8/2014
Julian Date:	120	Julian Date:	252
Seeding Rate:	80 lb/A	Soil Test:	163-14-138
Previous Crop:	Alfalfa	Fertilizer:	200-30-100
Tillage:	Conventional	Herbicide:	Huskie 11 floz/A and Axial XL 16.4 floz/A
Irrigation:	None	Insecticide:	Warrior 1.5 floz/A
Soil Type:	Creston Sil		

Table 2. Agronomic data from the evaluation of advanced spring wheat lines 2014.

Cultivar	HD Julian	SR %	HT in	LOD %	YLD bu/A	PRO %	TWT lb/bu	CI %	SEP %
LIMAGR143	178	3.7	41.3	3.3	130.8	13.7	61.5	23.7	0.0
MCNEAL	182	8.0	35.7	0.0	121.9	13.3	60.5	8.5	0.0
MT 1225	179	7.0	33.7	0.0	119.3	14.0	58.5	12.5	0.0
MT 1316	176	5.7	34.7	0.0	118.7	15.0	60.4	18.0	0.0
MT 1234	179	10.0	37.7	3.3	117.6	14.3	60.9	6.0	0.0
MT 1276	178	0.0	36.3	0.0	116.9	13.7	59.8	18.0	0.0
LIMAGR141	182	2.7	33.7	0.0	116.4	13.3	58.7	12.2	0.0
WB GUNNISON	179	5.0	34.3	0.0	116.1	13.3	61.8	40.8	0.0
CORBIN	179	3.0	35.7	0.0	115.6	13.3	61.0	22.0	0.0
LIMAGR142	177	5.0	35.3	0.0	114.3	12.7	61.4	10.8	0.0
MT 1230	180	4.0	35.3	0.0	113.5	14.6	58.9	9.2	0.0
MT 1236	178	3.3	34.3	0.0	113.0	14.9	59.2	10.2	0.0
WB143	176	4.0	28.7	0.0	112.4	15.3	59.6	12.0	0.0
MT 1346	177	6.3	36.7	0.0	112.3	14.5	59.8	37.5	0.0
MT 1227	182	4.7	35.7	1.7	112.0	14.6	58.4	8.5	0.0
MT 1320	177	0.7	39.0	0.0	112.0	14.1	60.7	10.5	0.0
MT 1273	180	3.3	36.0	1.7	111.6	12.9	60.7	13.5	0.0
MOTT	182	7.7	40.3	0.0	111.3	13.2	59.9	8.0	0.0
VOLT	183	0.7	32.3	0.0	111.1	13.5	61.3	9.7	0.0
VIDA	181	1.3	35.7	1.7	110.8	14.2	59.9	10.5	0.0
SY SOREN	179	1.7	33.0	0.0	110.7	14.6	60.6	20.8	0.0
BUCK PRONTO	176	3.7	37.0	0.0	110.7	14.5	60.3	40.8	0.0
WB142	180	1.7	30.3	0.0	110.7	14.7	59.3	10.2	0.0
MT 1203	176	16.7	35.3	1.7	109.6	14.7	59.7	12.2	0.0
MT 1343	179	7.3	37.0	0.0	109.3	14.8	59.7	10.2	0.0
MT 1118	178	4.0	32.3	0.0	109.2	14.3	57.4	12.2	0.0
MT 1206	178	4.0	34.3	10.0	109.2	14.0	61.1	7.5	0.0
MT 1219	178	3.7	34.3	1.0	109.2	13.7	60.1	7.5	0.0
EGAN	181	0.0	36.3	0.0	109.2	15.4	60.3	9.5	0.0
MT 1338	176	4.3	36.0	0.0	109.2	14.4	61.5	15.0	0.0
SY ROWYN	177	4.3	32.7	2.7	109.0	13.7	59.5	13.0	0.0
WB141	178	27.3	37.0	0.0	108.8	13.4	57.7	17.0	0.0

HD: heading date, SR: stripe rust, HT: height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight, CI: crop injury, SEP: Septoria

Table 2. continued.

Cultivar	HD Julian	SR %	HT in	LOD %	YLD bu/A	PRO %	TWT lb/bu	CI %	SEP %
MT 1304	175	2.0	34.0	2.0	108.7	13.9	61.5	12.5	0.0
MT 1319	177	3.0	37.3	0.0	108.7	14.6	60.6	12.2	0.0
MT 1348	176	2.3	34.0	1.7	108.4	14.1	60.5	8.8	0.0
MT 1349	178	2.3	33.0	0.0	108.4	15.0	58.6	14.5	0.0
CHOTEAU	178	7.3	35.3	3.3	108.0	13.5	59.9	13.2	0.0
MT 1224	178	10.3	35.0	0.0	107.3	13.4	58.9	13.2	0.0
DUCLAIR	177	11.7	35.3	0.0	106.5	14.3	59.7	30.5	0.0
SY605 CL	175	1.7	38.0	0.0	105.5	14.8	61.5	6.8	0.0
MT 1333	178	3.7	34.7	0.0	105.2	14.4	61.0	11.7	0.0
MT 1264	177	5.0	33.7	0.0	104.9	14.3	59.0	9.3	0.0
WB144	180	3.7	31.0	0.0	104.6	13.4	61.8	16.2	0.0
REEDER	179	1.3	36.3	0.0	104.5	14.3	60.8	11.3	0.0
MT 1340	177	15.7	29.0	0.0	103.9	14.5	58.6	16.5	8.3
MT 1341	176	6.3	33.3	0.0	103.7	14.3	60.1	14.7	0.0
WB9879CL	180	3.3	34.3	0.0	102.6	13.7	60.0	13.3	5.0
MT 1360	178	2.3	36.3	0.0	101.5	15.8	58.5	17.5	0.0
SY TYRA	179	4.7	31.3	0.0	101.1	13.5	59.8	12.3	0.0
MT 1007	178	13.7	34.0	0.0	100.4	14.4	60.5	8.0	0.0
SY INGMAR	178	3.3	33.0	0.0	100.3	15.3	60.7	15.2	0.0
MT 1231	177	4.7	34.7	0.0	100.2	14.6	59.6	7.2	0.0
MT 1336	177	19.7	32.0	0.0	100.2	14.2	59.2	14.2	0.0
ONEAL	182	19.3	35.3	0.0	99.4	13.8	60.5	9.7	0.0
MT 1205	176	16.3	34.7	8.3	98.3	13.7	60.1	13.0	0.0
MT 1222	177	15.0	35.0	0.0	98.3	15.6	58.8	12.5	0.0
MT 1331	178	0.0	32.0	0.0	98.2	13.9	56.8	10.8	0.0
MT 1228	180	9.3	35.3	0.0	97.7	13.9	54.4	10.8	0.0
FORTUNA	180	3.3	43.3	3.3	97.5	14.6	61.4	10.8	0.0
MT 1337	176	19.0	33.0	0.0	94.9	15.4	55.4	10.0	18.3
BRENNAN	176	2.0	30.7	0.0	94.0	14.7	59.7	21.8	0.0
MT 1315	175	2.3	36.3	0.0	93.1	15.5	60.8	15.0	0.0
THATCHER	184	9.7	49.0	15.0	87.9	13.8	59.3	14.2	0.0
JEDD	176	52.7	27.7	0.0	85.8	13.2	59.2	10.2	0.0
Mean	178	6.9	34.9	1.0	107.2	14.2	59.8	14.0	0.5
CV	0.7	72.2	4.7	285.1	9.8	NA	NA	33.0	583.5
LSD	1.9	8.1	2.6	4.4	16.9	NA	NA	7.5	4.7
Pr>F	0.0001	0.0001	0.0001	0.0001	0.0042	NA	NA	0.0001	0.0001

HD: heading date, SR: stripe rust, HT: height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight, CI: crop injury, SEP: Septoria

Title: Evaluation of Sm1 experimental spring wheat lines for resistance to the Orange Wheat Blossom Midge (OWBM).

Objective: To evaluate insect resistance and agronomic performance of experimental spring wheat lines in different environments.

Report:

Forty three experimental lines containing the Sm1 gene for resistance to the OWBM were established in non-replicated, observation nurseries at Bozeman, Conrad, and Kalispell, MT. Susceptible (Hank) and resistant (Egan) check varieties were also included for comparison.

Midge populations were low to non-existent at all three locations. As a result, it was not possible to assess the level of resistance expressed in the experimental lines. However, the agronomic performance of the entries was determined.

The following data values are representative averages across all locations. Mean Julian calendar heading date was 180 days (June 29) and ranged from 178 (June 27) to 183 (July 2), compared to Hank at 180 and Egan at 182 days. Heights averaged 32.0 inches and ranged from 28.7 to 38.2 inches in comparison to Hank and Egan at average heights of 31.8 and 33.5 inches respectively. Yields averaged 96.1 bu/A and ranged from 63.7 to 117.3 bu/A compared to Hank with an average yield of 95.6 bu/A and Egan averaging at 90.7 bu/A. Protein averaged 14.8% and ranged from 13.7 to 16.7 % while protein values averaged 14.6% and 15.9% for Hank and Egan, respectively. Test weight averaged 59.2 lb/bu and ranged from 55.3 to 62.7 lb/bu, while Hank and Egan averaged 57.0 and 58.7 lb/bu respectively. Two orange wheat blossom midge larvae detected were on experimental line 12400592 at Conrad.

Table 1. Materials and Methods - OWBM resistance screening - 2014

Seeding Date:	5/1/2014	Harvest Date:	8/29/2014
Julian Date:	121	Julian Date:	241
Seeding Rate:	80 lb/A	Soil Type:	Creston Sil
Previous Crop:	Fallow	Soil Test:	431-40-258
Tillage:	Conventional-Till	Fertilizer:	200-30-100
Irrigation:	N/A	Herbicide:	Huskie 11 floz/A and Axial XL 16.4 floz/A
		Fungicide:	Headline 9 floz/A

Table 2. Multi location agronomic data for SM1 experimental lines - 2014.

	Heading date Julian				Height inches			
ID	Kalispell	Bozeman	Conrad	Average	Kalispell	Bozeman	Conrad	Average
12400015	182	182	182	182	31.0	32.3	31.0	31.4
12400016	175	181	182	179	32.0	32.5	32.0	32.2
12400016	178	180	.	179	35.0	32.5	36.0	34.5
12400016	178	182	.	180	33.0	32.7	35.0	33.6
12400038	175	178	181	178	32.0	30.7	26.0	29.6
12400038	179	179	.	179	31.0	31.3	38.0	33.4
12400038	177	180	181	179	33.0	31.5	30.0	31.5
12400038	178	180	181	180	33.0	30.7	28.0	30.6
12400052	175	182	183	180	30.0	30.9	27.0	29.3
12400467	178	182	182	181	32.0	31.9	32.0	32.0
12400592	178	182	181	180	32.0	30.5	39.0	33.8
12400725	176	183	182	180	33.0	32.3	30.0	31.8
12400817	178	181	182	180	35.0	30.9	31.0	32.3
12400817	177	182	184	181	30.0	31.5	29.0	30.2
12400877	180	178	181	180	39.0	33.7	30.0	34.2
12400967	179	179	181	180	32.0	31.3	29.0	30.8
12400976	176	182	182	180	30.0	32.9	29.0	30.6
12400986	177	180	182	180	33.0	31.9	28.0	31.0
12401032	181	180	182	181	35.0	32.9	31.0	33.0
12401047	178	182	182	181	35.0	32.1	33.0	33.4
12401117	180	178	180	179	34.0	35.2	30.0	33.1
12401161	181	178	181	180	34.0	32.9	31.0	32.6
12401161	178	178	181	179	32.0	33.5	31.0	32.2
12401182	178	182	182	181	34.0	31.1	27.0	30.7
12401182	177	181	183	180	35.0	31.1	30.0	32.0
12401183	178	180	182	180	33.0	30.9	28.0	30.6
12401190	179	183	182	181	34.0	30.5	30.0	31.5
12401218	177	181	181	180	35.0	31.1	32.0	32.7
12401218	180	182	182	181	33.0	31.3	31.0	31.8
12401227	178	181	182	180	35.0	31.7	27.0	31.2
12401228	178	180	182	180	32.0	30.5	28.0	30.2
12401236	178	181	183	181	36.0	31.9	29.0	32.3
12401277	178	181	182	180	34.0	31.7	29.0	31.6
12401288	180	182	183	182	33.0	32.1	33.0	32.7
12401322	178	180	181	180	33.0	36.6	31.0	33.5
12401372	177	180	180	179	35.0	33.1	30.0	32.7
12401406	178	182	183	181	32.0	31.9	28.0	30.6
12401424	178	180	181	180	35.0	30.1	30.0	31.7
12401502	178	182	183	181	33.0	33.1	31.0	32.4
12401518	178	181	182	180	34.0	30.9	30.0	31.6
12401687	177	179	181	179	35.0	30.1	28.0	31.0
12401935	181	178	181	180	34.0	31.3	28.0	31.1
12401988	180	180	182	181	33.0	31.5	30.0	31.5
HANK	177	178	182	179	32.0	31.3	32.0	31.8
HANK	182	178	181	180	32.0	33.1	30.0	31.7
HANK	177	178	182	179	33.0	32.9	31.0	32.3
HANK	182	178	181	180	32.0	32.7	30.0	31.6
CAP400	183	183	183	183	36.0	33.5	31.0	33.5
CAP400	178	183	182	181	36.0	33.9	30.0	33.3
CAP400	177	183	183	181	35.0	35.4	32.0	34.1
CAP400	183	183	183	183	34.3	32.6	32.0	33.0
MEAN	178	181	182	180	33.4	32.1	30.5	32.0
MIN	175	178	180	178	30.0	30.1	26.0	28.7
MAX	183	183	183	183	39.0	36.6	39.0	38.2

Table 2 continued.

	Yield bu/A				Protein %			
ID	Kalispell	Bozeman	Conrad	Average	Kalispell	Bozeman	Conrad	Average
12400015	96.9	91.5	82.5	90.3	14.2	14.7	.	14.4
12400016	102.0	95.5	83.2	93.6	15.0	15.3	.	15.2
12400016	108.2	88.9	79.6	92.2	14.0	15.1	.	14.6
12400016	112.4	83.0	80.3	91.9	13.5	14.5	.	14.0
12400038	95.2	96.1	85.9	92.4	14.8	14.4	.	14.6
12400038	100.0	88.5	97.5	95.3	15.0	14.3	.	14.6
12400038	104.9	79.1	85.9	90.0	14.2	14.6	.	14.4
12400038	112.8	91.6	92.0	98.8	14.4	14.8	.	14.6
12400052	107.5	101.4	82.5	97.1	14.4	15.3	.	14.9
12400467	109.8	79.1	77.7	88.8	14.1	15.6	.	14.8
12400592	114.0	93.9	107.7	105.2	14.1	14.8	.	14.4
12400725	121.0	92.7	78.3	97.3	13.8	16.2	.	15.0
12400817	115.7	82.2	116.5	104.8	14.0	14.9	.	14.5
12400817	117.6	78.5	38.5	78.2	13.9	15.7	.	14.8
12400877	117.8	99.7	119.9	112.5	16.1	14.6	.	15.3
12400967	108.7	76.4	90.1	91.7	13.7	15.6	.	14.7
12400976	115.7	90.2	90.2	98.7	13.7	15.1	.	14.4
12400986	127.3	82.3	89.9	99.8	14.2	15.2	.	14.7
12401032	108.1	84.2	86.5	93.0	14.7	14.8	.	14.8
12401047	113.7	84.7	93.3	97.3	14.2	16.0	.	15.1
12401117	100.6	96.5	89.5	95.5	13.9	14.8	.	14.4
12401161	115.8	97.4	120.3	111.1	16.4	14.1	.	15.2
12401161	116.5	96.2	116.6	109.8	14.5	14.3	.	14.4
12401182	125.8	63.6	69.6	86.3	14.4	14.7	.	14.6
12401182	103.8	80.3	94.5	92.9	14.8	15.2	.	15.0
12401183	113.7	88.1	98.1	100.0	14.4	14.9	.	14.7
12401190	113.5	85.9	86.4	95.3	14.5	14.8	.	14.7
12401218	119.5	96.8	115.6	110.6	14.4	14.8	.	14.6
12401218	111.0	87.9	82.9	93.9	14.5	15.0	.	14.8
12401227	119.7	86.3	78.3	94.8	13.8	14.0	.	13.9
12401228	116.0	86.6	83.3	95.3	14.0	15.0	.	14.5
12401236	119.7	92.2	80.4	97.5	15.1	15.2	.	15.1
12401277	109.1	104.4	90.3	101.2	14.3	15.4	.	14.9
12401288	111.6	97.9	99.3	102.9	15.0	15.3	.	15.2
12401322	113.0	101.7	85.6	100.1	14.6	15.3	.	14.9
12401372	113.5	80.2	86.4	93.4	14.5	15.2	.	14.8
12401406	108.7	94.2	79.7	94.2	14.7	15.2	.	14.9
12401424	102.4	95.7	102.5	100.2	14.6	15.3	.	15.0
12401502	109.5	97.4	104.3	103.7	14.7	14.8	.	14.7
12401518	111.6	78.6	96.0	95.4	13.8	15.8	.	14.8
12401687	89.2	73.5	86.2	83.0	14.4	14.7	.	14.5
12401935	114.3	100.4	92.0	102.2	14.0	15.2	.	14.6
12401988	91.0	96.7	75.4	87.7	15.3	15.1	.	15.2
HANK	115.8	98.5	79.0	97.8	14.3	14.6	.	14.4
HANK	107.2	99.0	83.5	96.6	14.5	14.4	.	14.4
HANK	105.6	95.3	85.8	95.6	14.2	15.3	.	14.8
HANK	99.6	90.7	86.7	92.3	15.3	14.6	.	15.0
EGAN	108.9	76.3	70.8	85.4	16.3	16.4	.	16.3
EGAN	110.3	88.6	80.0	93.0	15.6	16.8	.	16.2
EGAN	104.9	85.7	82.9	91.2	14.6	17.1	.	15.9
EGAN	109.3	90.9	79.8	93.3	14.8	15.4	.	15.1
MEAN	110.2	89.5	88.6	96.1	14.5	15.1	.	14.8
MIN	89.2	63.6	38.5	63.7	13.5	14.0	.	13.7
MAX	127.3	104.4	120.3	117.3	16.4	17.1	.	16.7

Table 2 continued.

	Test weight lb/bu				OWBM numbers/spike			
ID	Kalispell	Bozeman	Conrad	Average	Kalispell	Bozeman	Conrad	Average
12400015	59.1	59.7	59.3	59.4	0.0	.	0.0	0.0
12400016	58.5	61.9	58.5	59.6	0.0	.	0.0	0.0
12400016	58.8	60.6	59.0	59.4	0.0	.	0.0	0.0
12400016	60.7	60.8	58.6	60.0	0.0	.	0.0	0.0
12400038	58.8	62.3	59.8	60.3	0.0	.	0.0	0.0
12400038	57.0	61.5	60.1	59.6	0.0	.	0.0	0.0
12400038	58.6	61.2	61.1	60.3	0.0	.	0.0	0.0
12400038	58.9	62.1	60.0	60.3	0.0	.	0.0	0.0
12400052	58.7	57.6	58.4	58.2	0.0	.	0.0	0.0
12400467	59.1	58.4	58.5	58.7	0.0	.	0.0	0.0
12400592	57.9	58.9	59.6	58.8	0.0	.	2.33	1.2
12400725	59.6	56.8	58.8	58.4	0.0	.	0.0	0.0
12400817	59.3	61.0	63.6	61.3	0.0	.	0.0	0.0
12400817	58.4	60.8	58.4	59.2	0.0	.	0.0	0.0
12400877	58.6	61.5	61.8	60.7	0.0	.	0.0	0.0
12400967	57.9	58.7	59.8	58.8	0.0	.	0.0	0.0
12400976	59.5	60.2	57.3	59.0	0.0	.	0.0	0.0
12400986	56.9	60.8	58.8	58.8	0.0	.	0.0	0.0
12401032	59.0	60.0	59.3	59.4	0.0	.	0.0	0.0
12401047	57.1	60.1	58.4	58.5	0.0	.	0.0	0.0
12401117	57.6	62.3	58.1	59.3	0.0	.	0.0	0.0
12401161	59.2	60.8	61.6	60.5	0.0	.	0.0	0.0
12401161	58.4	61.1	58.1	59.2	0.0	.	0.0	0.0
12401182	59.3	60.4	57.5	59.1	0.0	.	0.0	0.0
12401182	56.9	60.9	61.7	59.8	0.0	.	0.0	0.0
12401183	57.2	61.8	61.4	60.1	0.0	.	0.0	0.0
12401190	56.4	61.8	62.1	60.1	0.0	.	0.0	0.0
12401218	62.3	61.0	61.6	61.7	0.0	.	0.0	0.0
12401218	59.5	60.7	57.6	59.3	0.0	.	0.0	0.0
12401227	61.0	59.7	56.7	59.1	0.0	.	0.0	0.0
12401228	59.4	60.1	58.5	59.3	0.0	.	0.0	0.0
12401236	58.3	60.0	55.3	57.9	0.0	.	0.0	0.0
12401277	58.4	59.7	60.4	59.5	0.0	.	0.0	0.0
12401288	58.7	61.0	61.9	60.5	0.0	.	0.0	0.0
12401322	55.9	61.4	59.9	59.1	0.0	.	0.0	0.0
12401372	55.6	58.4	58.7	57.5	0.0	.	0.0	0.0
12401406	58.2	59.7	59.2	59.0	0.0	.	0.0	0.0
12401424	58.9	60.0	60.1	59.7	0.0	.	0.0	0.0
12401502	59.8	59.8	60.2	59.9	0.0	.	0.0	0.0
12401518	57.7	58.7	59.3	58.6	0.0	.	0.0	0.0
12401687	57.8	59.6	60.5	59.3	0.0	.	0.0	0.0
12401935	61.7	61.4	61.1	61.4	0.0	.	0.0	0.0
12401988	56.0	59.5	59.4	58.3	0.0	.	0.0	0.0
HANK	58.6	57.3	55.5	57.1	0.0	.	0.0	0.0
HANK	54.6	57.6	56.7	56.3	0.0	.	0.0	0.0
HANK	58.0	56.1	56.9	57.0	0.0	.	0.0	0.0
HANK	57.1	57.1	58.7	57.7	0.0	.	0.0	0.0
EGAN	58.8	57.5	57.7	58.0	0.0	.	0.0	0.0
EGAN	60.7	58.5	58.4	59.2	0.0	.	0.0	0.0
EGAN	60.3	57.5	58.7	58.8	0.0	.	0.0	0.0
EGAN	58.2	58.6	59.2	58.7	0.0	.	0.0	0.0
MEAN	58.5	59.9	59.3	59.2	0.0	.	0.05	0.0
MIN	54.6	56.1	55.3	55.3	0.0	.	0.0	0.0
MAX	62.3	62.3	63.6	62.7	0.0	.	2.3	1.2

Project Title:	Effect of Plant Growth Regulators (PGRs) and Fungicides on the Performance of Winter Wheat Varieties – 2014.
Objective:	To evaluate the effects of PGRs and fungicides on the agronomic performance of winter wheat varieties.

Lodging and stripe rust are recurring problems in winter wheat. This study was designed to determine which production issue has the most negative effect on winter wheat performance. The study was established as a split plot, randomized complete block design with three replications. The sub plot treatments consisted of seven winter wheat varieties which varied in height and susceptibility to stripe rust. The varieties included Bynum, Curlew, Decade, Jagalene, Promontory, Whetstone, and Yellowstone. The whole plot treatments consisted of foliar applications of Quilt and Palisade applied alone or in combination. A non-treated control was also included for each variety. The treatments were applied on May 30th when the crop was at early boot stage.

Despite a low level of stripe rust pressure, the main effect of fungicide was significant. The application of Quilt reduced stripe rust infection, regardless of variety, and afforded a yield increase of 11 bu/A compared to either the check or Palisade (Table 2). Significant varietal differences in susceptibility to stripe rust were observed. Decade was the most susceptible variety and had an infection level of 24.3%, while Promontory expressed the greatest resistance and had an infection level of 0.2%, regardless of fungicide treatment (Table 3). Decade benefited the most from the fungicide application (Table 4).

Plant height ranged from 35.9 inches for Whetstone to 42.7 inches for Curlew. Not surprisingly, Curlew expressed the greatest degree of lodging at 49.2 percent. The main effect of Palisade was significant, with an average height reduction of 3.0 inches. At the same time, lodging scores decreased from 16.9 % to 3.8 % percent when treated with Palisade (Table 2). However, Palisade applied alone did not improve yields compared to the non-treated check (Table 2).

Summary:

Overall, stripe rust had the greater impact on yield reductions than lodging. Therefore, the application of Quilt had a greater positive impact on grain yield.

Table 1. Materials and Methods - Effect of PGR andFungicide on Winter Wheat. Kalispell, 2014

Seeding Date:	10/1/2013	Harvest Date:	8/12/2014
Julian Date:	274	Julian Date:	223
Seeding Rate:	80 lbs/A	Soil Type:	Creston SiL
Previous Crop:	Peas	Soil Test:	259-16-172
Tillage:	Conventional	Fertilizer:	9-40-10 / TD 130-0-0
Irrigation:	None	Herbicide:	Rimfire Max 85 g/A, Huskie 11 floz/A and Preference 25%v/v

Table 2. Main effect of fungicide and PGR inputs on agronomic performance of winter wheat. Kalispell, 2014.

Input	SR %	SEP %	HD Julian	HT in	LOD %	YLD BU	PRO %	TWT lb/bu	TKW g	FN sec	MC %
Check	10.5	21.4	157	40.9	16.5	159.3	12.9	61.8	40.5	396.5	10.3
Palisade	10.8	23.8	157	37.9	6.6	160.1	13.0	62.1	40.5	390.2	10.2
Quilt	0.9	12.4	157	40.3	16.9	170.1	13.3	62.2	41.6	380.0	10.3
Palisade & Quilt	1.1	14.9	157	38.6	3.8	165.4	13.4	62.3	41.7	396.8	10.3
LSD	9.2	8.7	0.3	1.4	7.0	4.7	0.2	ns	ns	ns	ns
Pr>F	0.0577	0.0537	0.0148	0.0070	0.0075	0.0040	0.0034	0.3835	0.0654	0.5289	0.7873

Table 3. Main effect of cultivars on agronomic performance of winter wheat. Kalispell, 2014.

Cultivar	SR %	SEP %	HD Julian	HT in	LOD %	YLD BU	PRO %	TWT lb/bu	TKW g	FN sec	MC %
Bynum	3.8	11.7	156	40.9	14.0	146.5	14.5	62.2	39.4	385.9	10.1
Curlew	0.9	7.8	159	42.7	49.2	163.2	13.4	62.0	40.5	377.0	10.6
Decade	24.3	16.2	156	37.7	0.0	151.2	13.4	61.0	37.5	414.1	10.0
Jagalene	8.8	19.3	156	38.6	0.0	175.9	13.0	62.9	43.8	376.6	10.3
Promontory	0.2	13.7	156	39.4	0.4	172.9	11.9	63.0	42.8	348.6	10.3
Whetstone	1.0	25.9	155	35.9	0.0	159.2	13.5	62.1	40.7	424.1	10.2
Yellowstone	1.8	32.4	160	40.9	13.1	177.4	12.3	61.5	42.8	409.9	10.5
LSD	7.6	6.4	0.8	1.6	11.5	6.6	0.2	0.4	1.2	13.5	0.3
Pr>F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0009

SR: stripe rust, SEP: septoria, HD: heading, HT: height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, FN: falling number, MC: moisture, ns: nonsignificant.

Table 4. Effect of fungicide and PGR on cultivar agronomic performance of winter wheat. Kalispell, 2014.

Input	SR	SEP	HD	HT	LOD	YLD	PRO	TWT	TKW	FN	MC
	%	%	Julian	in	%	BU	%	lb/bu	g	sec	%
						Check					
Bynum	9.0	14.3	156	41.6	26.7	135.3	14.4	61.8	39.3	400.8	10.0
Curlew	0.0	6.3	159	41.9	71.7	163.3	13.4	61.7	39.3	368.1	10.4
Decade	43.3	20.0	155	39.6	0.0	142.2	12.5	59.9	35.3	422.3	10.2
Jagalene	17.0	26.7	156	41.6	0.0	176.5	12.6	63.2	43.7	372.2	10.3
Promontory	0.0	19.3	156	41.7	0.0	165.9	11.8	63.2	42.3	349.5	10.1
Whetstone	1.7	25.0	154	37.9	0.0	159.2	13.3	62.1	41.0	446.5	10.3
Yellowstone	2.3	38.3	159	42.0	17.3	172.8	12.2	61.0	42.3	415.9	10.4
						Palisade					
Bynum	5.3	16.7	156	38.8	6.0	148.0	14.2	62.4	38.7	383.2	10.0
Curlew	2.7	10.7	159	42.5	40.0	159.3	13.5	62.0	39.7	369.3	10.7
Decade	48.7	21.7	156	35.8	0.0	139.6	12.9	60.7	36.0	410.8	10.0
Jagalene	16.7	24.0	156	37.1	0.0	172.9	12.6	63.0	43.0	367.6	10.2
Promontory	0.7	21.3	156	37.1	0.0	170.6	11.9	63.2	43.3	354.5	10.4
Whetstone	0.0	31.0	155	34.3	0.0	154.4	13.5	61.9	40.3	432.3	10.0
Yellowstone	1.7	41.3	160	39.8	0.0	175.8	12.3	61.6	42.3	413.9	10.4
						Quilt					
Bynum	1.0	5.3	155	42.9	21.7	151.8	14.9	62.2	40.3	386.7	10.0
Curlew	0.7	5.7	158	43.8	65.0	166.5	13.4	62.2	40.7	367.4	10.7
Decade	2.0	11.0	156	39.9	0.0	165.8	14.0	61.7	39.7	401.7	9.7
Jagalene	0.7	13.7	156	38.5	0.0	179.3	13.4	62.0	43.3	357.2	10.4
Promontory	0.0	6.7	156	40.0	1.7	181.6	11.9	63.3	42.7	344.6	10.4
Whetstone	0.7	19.0	155	35.6	0.0	163.2	13.5	62.3	41.3	407.4	10.3
Yellowstone	1.0	25.3	160	41.1	30.0	182.7	12.3	61.6	43.3	395.3	10.5
						Palisade & Quilt					
Bynum	0.0	10.3	156	40.2	1.7	151.0	14.6	62.4	39.3	372.7	10.3
Curlew	0.3	8.3	160	42.4	20.0	163.6	13.4	62.3	42.3	403.1	10.5
Decade	3.3	12.0	158	35.4	0.0	157.0	14.1	61.6	39.0	421.6	10.0
Jagalene	0.7	12.7	156	37.1	0.0	174.8	13.4	63.4	45.0	409.5	10.1
Promontory	0.0	7.3	156	38.6	0.0	173.3	12.1	62.5	42.7	345.9	10.4
Whetstone	1.7	28.7	155	36.0	0.0	159.9	13.6	62.1	40.0	410.2	10.0
Yellowstone	2.0	24.7	160	40.7	5.0	178.5	12.5	61.9	43.3	414.4	10.6
LSD	15.3	ns	ns	ns	ns	ns	0.445	0.8701	ns	27.084	ns
Pr>F	0.0011	0.8934	0.6220	0.4162	0.1480	0.5108	0.0001	0.0128	0.2053	0.0272	0.7205

SR: stripe rust, SEP: septoria, HD: heading, HT: height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight, TKW: thousand kernel weight, FN: falling number, MC: moisture, ns: nonsignificant.

Title: Evaluation of winter wheat lines for stripe rust resistance and agronomic performance.

Objective: To evaluate stripe rust resistance, yield potential and agronomic attributes of experimental winter wheat lines.

Report:

Sixty one experimental winter wheat lines and three check varieties (Yellowstone, Promontory, and Decade) were evaluated for stripe rust resistance in a non-replicated, observation nursery. Overall, the stripe rust pressure was low this year with only four of the 64 cultivars showing symptoms of stripe rust infection. Decade, a known susceptible variety, had the greatest level of infection at 30.0 percent. Septoria pressure was moderate to high this year. Infection levels averaged 29.1% and ranged from 5.0 to 60.0 percent. Powdery mildew levels averaged 4.3% and ranged from 0.0 to 40.0 percent. Yields averaged 162.0 bu/A and ranged from 135.6 bu/A for 09X260cD15 to 189.4 bu/A for 09X108cD12. Protein averaged 13.1% and ranged from 11.8% for Promontory to 14.7% for 09X284cD29. Test weights averaged 60.3 lb/bu ranging from 57.1 lb/bu for 09X260cD15 to 62.6 lb/bu for Promontory and 07X76CF79. Heading dates spanned 10 days and averaged 159 Julian days (June 8). Heights averaged 41.8 inches and ranged from 31.9 inches to 46.1 inches. Lodging was observed in 12 of the 64 varieties with an average of 6.6% ranging from 0.0% to 80.0 percent.

Summary:

Cultivar 09X108cD12, afforded the highest yield and demonstrated the greatest level of resistance to powdery mildew, stripe rust and septoria.

Table 1. Materials and Methods - Winter Wheat Stripe Rust Screening - 2014

Seeding Date:	10/1/2013	Harvest Date:	8/12/2014
Julian Date:	274	Julian Date:	224
Seeding Rate:	80 lb/A	Soil Type:	Creston SiL
Previous Crop:	Peas	Soil Test:	259-16-172
Tillage:	Conventional	Fertilizer:	9-40-10 / TD 130-0-0
Irrigation:	None	Herbicide:	Rimfire Max 85 g/A, Huskie 11 floz/A and Preference 25%v/v

Table 2. Effect of stripe rust resistance on winter wheat varieties- 2014.

Cultivar	HD Julian	HT in	LOD %	PMD %	SR %	SEP %	YLD bu/A	PRO %	TWT lb/bu
09X108cD12	161	44.9	0.0	0.0	0.0	5.0	189.4	12.9	60.6
07X76cF96	155	38.2	0.0	0.0	0.0	13.0	180.2	12.7	61.8
07X76cF81	162	44.9	30.0	0.0	0.0	45.0	179.4	12.2	59.2
07X76cF83	162	43.3	0.0	0.0	0.0	12.0	178.2	12.4	59.8
07X76cF80	161	44.1	0.0	0.0	0.0	43.0	178.1	12.2	60.5
09X111cD31	160	44.5	15.0	0.0	0.0	15.0	177.7	13.6	61.4
07X76cF24	156	44.1	0.0	0.0	0.0	45.0	176.3	12.0	60.4
Yellowstone	157	41.7	10.0	0.0	0.0	45.0	175.2	12.3	61.7
09X260cD53	159	44.5	0.0	8.0	0.0	30.0	174.3	12.5	59.9
09X257cD13	160	41.7	0.0	0.0	0.0	45.0	174.0	12.9	60.6
09X284cD30	160	38.6	0.0	0.0	0.0	16.0	172.1	14.3	60.2
07X74F13	160	44.9	25.0	0.0	0.0	30.0	171.0	12.4	60.8
07X76cF44	157	39.8	0.0	5.0	0.0	12.0	170.6	12.2	61.3
09X260cD6	162	43.7	30.0	0.0	0.0	20.0	169.2	12.8	60.9
07X76cF55	153	40.9	0.0	0.0	0.0	50.0	169.0	12.0	60.7
09X257cD9	160	37.4	0.0	0.0	0.0	10.0	168.2	13.6	59.4
09X284cD49	157	40.2	0.0	5.0	0.0	25.0	166.9	13.8	59.7
09X260cD75	163	45.7	0.0	10.0	0.0	44.0	166.5	12.9	58.9
07X76cF91	154	39.0	0.0	0.0	0.0	60.0	166.4	12.0	61.6
09X260cD10	160	44.1	0.0	0.0	0.0	24.0	165.2	12.6	59.6
09X284cD66	155	38.2	0.0	0.0	0.0	15.0	164.6	13.8	61.2
09X284cD13	156	40.2	0.0	0.0	0.0	15.0	164.6	14.0	60.6
09X260cD43	160	43.3	0.0	13.0	0.0	38.0	164.3	12.3	59.4
09X257cD33	159	38.6	15.0	0.0	0.0	23.0	164.3	12.7	60.7
09X284cD29	157	40.9	0.0	0.0	0.0	20.0	164.0	14.7	61.2
09X257cD47	159	41.7	0.0	0.0	0.0	50.0	164.0	13.8	60.7
09X260cD82	157	41.7	0.0	20.0	0.0	30.0	163.5	12.6	60.2
09X284cD85	157	38.6	0.0	5.0	0.0	12.0	163.4	14.6	61.1
09X260cD27	160	42.5	0.0	0.0	0.0	38.0	163.3	12.6	59.8
09X257cD45	160	41.7	0.0	0.0	0.0	30.0	162.7	13.7	60.8
09X257cD50	161	42.1	0.0	0.0	0.0	60.0	162.6	13.4	60.4
09X257cD18	159	40.2	0.0	0.0	0.0	40.0	162.4	13.6	59.8
09X260cD48	161	44.1	30.0	15.0	0.0	25.0	161.7	12.9	59.8
Promontory	159	44.1	0.0	5.0	0.0	8.0	161.6	11.8	62.6
09X257cD38	155	38.6	0.0	5.0	0.0	45.0	160.8	13.1	60.7
09X111cD30	157	41.3	0.0	5.0	0.0	27.0	160.5	13.9	61.3
07X76cF78	155	42.1	0.0	0.0	0.0	38.0	160.5	12.9	62.0
09X260cD26	159	44.5	0.0	0.0	0.0	50.0	160.3	12.7	60.5
09X284cD87	157	38.2	0.0	0.0	0.0	18.0	160.1	14.4	60.6
09X111cD28	160	46.1	80.0	20.0	0.0	8.0	159.9	13.1	61.1

HD: heading, HT: height, LOD: lodging, PMD: Powdery Mildew Disease, SR: stripe rust, SEP: septoria, YLD: yield, PRO: protein, TWT: test weight.

Table 2. continued

Cultivar	HD Julian	HT in	LOD %	PMD %	SR %	SEP %	YLD bu/A	PRO %	TWT lb/bu
09X260cD29	159	44.1	0.0	0.0	0.0	20.0	159.7	12.8	59.8
09X260cD76	161	44.1	0.0	30.0	0.0	40.0	159.3	12.8	58.0
09X111cD27	163	46.1	0.0	0.0	0.0	15.0	159.1	13.9	59.8
09X260cD2	160	43.3	0.0	0.0	0.0	13.0	158.7	12.7	60.4
09X260cD19	161	44.1	65.0	5.0	0.0	12.0	158.5	12.6	61.6
09X260cD85	160	41.7	0.0	0.0	0.0	23.0	157.9	12.7	59.6
09X257cD28	160	40.2	0.0	0.0	0.0	30.0	157.5	12.9	59.2
09X284cD32	155	40.2	0.0	0.0	10.0	25.0	157.5	14.5	60.8
09X257cD55	163	41.7	0.0	0.0	0.0	22.0	154.3	14.0	61.0
07X76cF87	157	35.4	0.0	0.0	0.0	20.0	153.9	13.1	62.4
09X260cD74	162	45.3	60.0	10.0	0.0	38.0	153.4	12.7	60.1
09X260cD28	158	44.5	0.0	0.0	0.0	15.0	152.8	12.9	59.7
07X76cF79	155	39.8	0.0	0.0	0.0	60.0	152.4	12.8	62.6
09X108cD4	160	40.2	0.0	10.0	0.0	20.0	151.4	14.0	60.4
09X257cD34	157	40.2	0.0	0.0	0.0	60.0	151.4	12.7	58.6
09X111cD24	160	43.3	0.0	5.0	0.0	15.0	150.9	13.3	60.1
09X108cD1	157	41.3	0.0	10.0	15.0	15.0	150.9	14.1	60.5
09X260cD80	160	44.1	0.0	40.0	0.0	45.0	149.7	12.4	58.5
Decade	156	40.6	0.0	20.0	30.0	20.0	149.5	12.7	60.9
09X260cD77	163	44.5	55.0	20.0	0.0	45.0	149.4	12.9	59.5
09X111cD38	163	44.1	5.0	5.0	0.0	25.0	148.4	13.9	59.7
09X257cD1	160	39.8	0.0	5.0	0.0	50.0	145.9	13.4	59.0
09X260cD15	160	31.9	0.0	0.0	10.0	50.0	135.6	12.8	57.1
Mean	159	41.8	6.6	4.3	1.0	29.1	162.0	13.1	60.3
Min	153	31.9	0.0	0.0	0.0	5.0	135.6	11.8	57.1
Max	163	46.1	80.0	40.0	30.0	60.0	189.4	14.7	62.6

HD: heading, HT: height, LOD: lodging, PMD: Powdery Mildew Disease, SR: stripe rust, SEP: septoria, YLD: yield, PRO: protein, TWT: test weight.

Project Title:	Evaluation of Winter Wheat Experimental Lines - 2014
Project Leader:	Bob Stougaard
Project Personnel:	Brooke Bohannon, Phil Bruckner, and Jim Berg
Objective:	To evaluate winter wheat varieties and experimental lines for agronomic performance in environments and cropping systems representative of northwestern Montana.

Results:

The 2014 growing season experienced very little stripe rust and the average level of infection was 6.6 percent. Septoria was present with an average rate of infection at 15.7% and ranging from 0 – 38% infection. Average days to heading was 159 (June 9) and average height was 38.5 inches. Lodging average 3% throughout the nursery, but ranged from 0 to 63 percent. The average yield was 136.2 bu/A with Colter yielding the highest at 153.3 bu/A and WB4059CLP yielding the lowest at 86.9 bu/A. Percent protein averaged 12.3 and test weights averaged 62 lb/bu.

Summary:

The 2014 growing conditions provided low disease pressure with adequate and timely moisture, resulting in high yields.

Table 1. Materials and Methods - Winter Wheat Intrastate, Kalispell - 2014

Seeding Date:	10/7/2013	Harvest Date:	8/8/2014
Julian Date:	280	Julian Date:	220
Seeding Rate:	80 lb/A	Soil Type:	Creston SiL
Previous Crop:	Peas	Soil Test:	259-16-172
Tillage:	Conventional	Fertilizer:	9-40-10 / TD 130-0-0
Irrigation:	None	Herbicide:	Rimfire Max 85 g/A, Huskie 11 floz/A and Preference 25%v/v

Table 2. Agronomic data from the intrastate winter wheat nursery, Kalispell 2014

Cultivar	SR %	SEP %	HD Julian	HT in	LOD %	YLD bu/A	PRO %	TWT lb/bu
Colter	0.0	34.0	161	39.4	0.7	153.3	12.8	61.7
MTCL1131	0.0	6.7	161	42.2	0.3	153.0	11.9	62.7
LCS Mint	0.0	15.0	154	37.6	0.3	151.1	12.7	60.3
WB3768	0.0	35.7	163	42.3	8.3	150.7	11.7	62.8
MT0978	0.0	5.3	161	40.9	7.0	150.4	12.4	63.0
MT1138	0.0	8.0	160	40.2	0.3	150.3	12.0	62.2
MT1262	0.0	19.0	160	39.9	63.3	149.0	13.0	62.0
MT1265	0.0	45	161	41.2	3.7	148.7	12.0	61.4
MTS1024	0.0	18	160	35.5	1.7	147.4	12.1	61.1
Freeman	0.0	6	152	36.7	2.7	146.8	12.3	61.0
MT1286	5.0	5	159	43.8	4.7	146.8	11.5	62.7
SY Clearstone 2CL	0.0	22	160	39.8	0.3	146.6	11.8	62.1
MT1117	0.0	9	161	41.0	0.7	146.3	12.1	63.0
MT1246	1.3	6	161	40.2	26.0	146.3	12.6	62.9
MT1257	0.0	12.0	161	38.1	0.0	145.8	12.1	62.3
MT1113	0.0	11.3	161	40.8	0.7	144.4	11.7	62.8
Keldin	0.0	10.3	159	36.6	0.3	144.2	12.6	61.9
MT1078	0.0	23.7	160	37.7	0.7	143.8	11.9	61.3
Cowboy	10.0	15.0	158	39.4	2.3	142.8	10.8	61.9
Promontory	0.0	13.7	158	36.5	0.0	142.6	11.6	64.0
Jagalene	8.3	9.3	157	35.9	0.0	141.9	12.5	63.7
MTF1232	8.3	26	163	51.1	0.0	141.9	13.1	62.7
MT1090	1.7	11	161	39.4	0.3	141.5	11.9	61.6
Yellowstone	2.3	24	162	38.3	0.0	140.2	11.9	62.0
Emerson	1.7	10	160	42.2	7.3	140.0	13.1	62.7
WB4535	2.3	28	159	35.9	0.3	139.5	12.3	62.5
MTS1224	1.7	23	162	34.8	7.7	139.0	12.6	62.2
LCS Colonia	5.0	39	163	33.4	0.0	138.7	12.1	57.7
MTCS1204	1.7	11.7	160	38.8	0.0	137.8	13.2	62.2
SY Wolf	0.0	15.0	157	36.7	0.3	137.7	12.7	61.8
Judee	0.0	12.3	159	36.9	1.0	137.0	12.4	62.6
Radiant	0.0	8.0	162	40.6	0.0	133.1	11.9	62.7
MTS1228	0.0	4.7	161	36.6	0.0	129.9	12.2	64.2
Broadview	7.0	7.7	160	37.6	0.3	129.4	11.9	61.9
Warhorse	0.0	9.3	160	36.6	2.0	128.9	13.3	61.6

SR: Stripe Rust, SEP: Septoria Leaf Spot, HD: heading, HT: height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight

Table 2 continued.

Cultivar	SR %	SEP %	HD Julian	HT in	LOD %	YLD bu/A	PRO %	TWT lb/bu
MTS0826-63	0.0	0	164	40.5	0.7	128.5	12.9	62.3
Ledger	2.7	8	158	35.5	0.3	127.2	12.1	62.3
McGill	12.3	5	156	38.1	1.3	126.9	12.0	61.5
Rampart	4.0	3	161	41.3	1.0	126.3	13.3	62.3
CDC Falcon	3.3	15	159	35.0	0.0	125.4	11.9	61.6
WB-Quake	2.5	14	161	37.7	1.0	122.5	12.5	62.6
Jerry	52.5	22	161	46.2	3.0	120.7	11.6	61.0
T158	0.0	17.3	153	31.4	0.0	120.1	12.6	62.5
Genou	35.0	4.7	161	40.0	1.3	118.9	12.1	62.1
Bearpaw	18.0	33.3	159	36.7	1.3	118.5	12.3	61.9
LCS Wizard	24.3	8.0	157	33.3	0.0	117.6	12.4	63.1
Decade	31.7	22.0	158	37.0	0.0	113.2	12.2	60.1
Carter	16.7	38.0	158	33.7	0.0	112.7	11.8	59.7
WB4059CLP	61.7	20.7	153	28.9	0.0	86.9	12.9	59.1
Mean	6.6	15.7	160	38.4	3.1	136.2	12.3	62.0
CV	124.3	61.7	0.6	4.7	259.8	5.2	—	—
LSD	13.2	15.7	1.6	2.9	13.1	11.5	—	—
Pr>F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	1.0000	0.0001

SR: Stripe Rust, SEP: Septoria Leaf Spot, HD: heading, HT: height, LOD: lodging, YLD: yield, PRO: protein, TWT: test weight

OILSEEDS

Project Title: Canola planting date and population study.

Objective: To identify the optimum canola planting date and density for northwestern Montana.

Materials and Methods:

The factorial treatment arrangement consisted of two canola varieties, three seeding dates and three plant densities. The two varieties selected were DKL 30-03 and DKL 70-07, representing early and late maturity groups, respectively. The three seeding dates were April 22, May 14 and May 29. The first seeding date was the earliest date we could get into the field. Subsequent planting dates were seeded at increments of 300 growing degree days at base 32F (GDD32), which represents the number of GDD necessary for the first true leaves to emerge. Targeted plant densities were 4, 8 and 16 plants per square foot. Seeding rates were calculated using the following formula: lb/A = (9.6 x desired plant density per sqft x thousand kernel weights) / percent survival (Table 1). The experimental design was a split plot randomized complete block with three replications, where the main plot factor was seeding date, and the sub plot factor consisted of plant density and variety combinations.

Soil test results showed 246-24-178 pounds of available nutrients and a fertilizer blend of 50-30-40-20 was broadcasted and incorporated one day prior to each seeding date. Each seeding date was treated with Warrior II for flea beetles and Endura for Sclerotinia.

Table 1. Seeding rates (lb/A) to achieve target plant density

Variety	Thousand Kernel Weight (g)	Plant Density/sqft	Seeding Rate (lb/A)
DKL 30-03	4.7	4	2.4
DKL 30-03	4.7	8	4.8
DKL 30-03	4.7	16	9.6
DKL 70-07	5.1	4	2.6
DKL 70-07	5.1	8	5.2
DKL 70-07	5.1	16	10.4

Estimated survival rate: 75%
lb/A = (9.6 x TKW x Plant Density)/75

Results:

The main effect of variety was significant for physiological development, lodging and oil content (Table 2). DKL 30-03, the earlier maturing variety, required fewer growing degree days to progress through all phenological stages than DKL 70-07, the late maturing variety (Table 2). DKL 30-03 demonstrated a greater degree of lodging at 45.1% compared to 36.1% for DKL 70-07. Oil content averaged 49.0% for DKL 30-03 and 48.2% for DKL 70-07.

The main effect of plant density was a significant effect on lodging (Table 3). As plant density increased, so too did percent lodging. The lowest plant density averaged 17.4% lodging compared to 70.8% for the highest plant density.

The main effect of seeding date was significant for physiological development, height, yield, biomass and oil content (Table 4). The April 22nd seeding date required the greatest number of days to achieve emergence, flowering, and physiological maturity. This most likely can be attributed to cooler temperatures in April and less accumulated growing degree days.

The first seeding date afforded the greatest yield at 78.8 bu/A compared to 38.7 bu/A from the last seeding date. The yield reductions observed in both the second and third seeding dates are likely a function of heat stress during flowering and pod development. The first seeding date achieved 50% flowering on June 23, while the second and third seeding dates reached 50% flower on July 5 and July 15, respectively. The 7 day average high and low temperatures that correspond with the 50% flowering dates for the three seeding dates were: 74/48°F, 81/53°F and 84/54°F. It is known that prolonged high temperatures near flowering can have a negative impact on yield, biomass and oil content.

Interactions occurred between variety and planting date resulting in significant differences for both yield and test weight (Table 6). The earlier seeding date provided the highest test weights and yields. As seeding date was delayed yields decreased for both varieties. However, the magnitude of the response was more dramatic for DKL 70-07 with a yield reduction of 60% compared to 40% for DKL 30-03. This suggests that DKL 30-03 is a more stable variety with regard to seeding date. No interactions were observed between variety and plant density, plant density and seeding date, or variety by plant density by seeding date (Tables 5, 7 and 8).

In summary, the greatest yield was afforded with the earliest seeding date despite the overall delay in crop development (Table 4). When faced with the decision of having to plant late or re-plant a field, one needs to know what the expected yield is for a particular field and estimate a yield reduction of 15-25% for a mid-May seeding date and a 30-50% yield reduction for a late May seeding date.

Table 2. Main effect of variety on agronomic performance of canola - 2014

	EMERG DAP	FLWR DAP	PM DAP	STAND 1 SQFT	STAND 2 SQFT	LOD %	HT in	YIELD BU	BIO g/sqft	OIL %	TWT lb/bu
DKL 30-03	8.6	52.4	95.7	12.9	12.4	45.1	56.1	61.9	109.6	49	48.7
DKL 70-07	9.1	53.8	98.5	12.1	11.5	36.1	56.7	59.2	104.3	48.2	48.9
LSD	0.4	0.8	0.6	ns	ns	5.2	ns	ns	ns	0.5	ns
Pr>0.05	0.0118	0.0012	0.0001	0.3615	0.3116	0.0019	0.1819	0.0677	0.4269	0.0028	0.3573

Table 3. Main effect of plant density on agronomic performance of canola - 2014

4 plants/ sqft	9.1	53.3	97.2	5.6	5.3	17.4	57.0	60.1	98.7	49.1	48.6
8 plants/sqft	8.8	52.9	97.1	10.9	10.7	33.7	56.7	63.2	110.8	48.4	48.8
16 plants/sqft	8.6	53.0	97.0	21.1	19.8	70.8	55.5	58.3	111.3	48.3	49.0
LSD	ns	ns	ns	1.9	1.8	15.0	ns	ns	ns	ns	ns
Pr>0.05	0.0849	0.2871	0.9397	0.0001	0.0001	0.0001	0.3759	0.2478	0.1319	0.1006	0.2446

Table 4. Main effect of planting date on agronomic performance of canola - 2014

4/22	13.8	61.8	107.3	11.2	10.7	46.9	56.6	78.8	107.0	49.2	49.4
5/14	6.9	50.7	93.3	12.7	12.1	45.0	59.5	64.1	130.3	48.2	48.9
5/29	5.8	46.8	90.7	13.6	13.1	30.0	53.1	38.7	83.6	48.4	48.0
LSD	0.9	1.1	0.8	ns	ns	ns	3.7	7.8	19.4	0.5	ns
Pr>0.05	0.0001	0.0001	0.0001	0.0753	0.0631	0.1643	0.0226	0.0003	0.0068	0.0097	0.1592

Table 5. Effect of variety and plant density on agronomic performance of canola - 2014

	EMERG DAP	FLWR DAP	PM DAP	STAND 1 SQFT	STAND 2 SQFT	LOD %	HT in	YIELD BU	BIO g/sqft	OIL %	TWT lb/bu
					DKL 30-03						
4 plants/ sqft	8.8	52.7	95.8	5.7	5.4	19.6	56.6	60.4	97.1	49.8	48.7
8 plants/sqft	8.7	52.3	95.7	10.8	10.9	39.4	56.2	64.8	108.6	48.9	48.5
16 plants/sqft	8.3	52.1	95.7	22.3	20.8	76.4	55.4	60.6	123	48.4	48.8
					DKL 70-07						
4 plants/ sqft	9.4	54.0	98.6	5.4	5.2	15.3	57.4	59.9	100.3	48.4	48.4
8 plants/sqft	9.0	53.6	98.6	11.1	10.6	27.9	57.2	61.6	113.1	47.9	49.1
16 plants/sqft	8.9	53.9	98.3	19.8	18.8	65.2	55.6	56.0	99.6	48.2	49.1
LSD	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Pr>0.05	0.7590	0.8190	0.9480	0.3756	0.6183	0.4124	0.7167	0.4841	0.1682	0.2079	0.1585

Emerg: emergence, DAP: days after planting, FLWR: 50% flowering, PM: physiological maturity, STAND 1: plant density prior to bolt, STAND 2: plant density at pod fill, LOD: lodging, HT: height, BIO: biomass, TWT: test weight

Table 6. Effect of variety and planting date on agronomic perormance of canola - 2014

	EMERG DAP	FLWR DAP	PM DAP	STAND 1 SQFT	STAND 2 SQFT	LOD %	HT in	YIELD BU	BIO g/sqft	OIL %	TWT lb/bu
					DKL 30-03						
4/22	13.3	61.4	106.1	11.4	10.9	51.7	56.2	75.8	107.4	49.8	49.1
5/14	6.8	49.8	91.9	12.4	12.0	50.0	59.9	65.1	132.9	48.5	48.6
5/29	5.7	45.9	89.1	14.9	14.2	33.8	52.1	44.9	88.4	48.9	48.3
					DKL 70-07						
4/22	14.3	62.2	108.4	11.0	10.6	42.2	57.0	81.9	106.5	48.7	49.7
5/14	7.1	51.6	94.8	13.0	12.1	40.0	59.1	63.1	127.6	48.0	49.2
5/29	5.9	47.7	92.2	12.3	11.9	26.2	54.1	32.6	78.8	47.8	47.7
LSD	ns	ns	ns	ns	ns	ns	ns	5.1	ns	ns	0.7
Pr>0.05	0.2072	0.4738	0.5113	0.3509	0.4462	0.9151	0.0871	0.0002	0.8596	0.5425	0.0357

Table 7. Effect of plant density and seeding date on agronomic performance of canola - 2014

	EMERG DAP	FLWR DAP	PM DAP	STAND 1 SQFT	STAND 2 SQFT	LOD %	HT in	YIELD BU	BIO g/sqft	OIL %	TWT lb/bu
					4 plants/ sqft						
4/22	13.8	62.2	108.2	4.8	4.5	21.7	59.0	76.4	105.7	49.8	49.2
5/14	7.2	50.7	93.0	5.5	5.3	25.0	60.3	67.9	114.9	49.1	48.6
5/29	6.3	47.2	90.3	6.3	6.2	5.7	51.7	36.1	75.6	48.5	47.8
					8 plants/ sqft						
4/22	13.8	61.7	107.7	10.2	9.5	48.3	56.2	83.7	108.7	49.1	49.4
5/14	6.8	50.7	93.7	11.0	11.2	39.2	61.0	65.5	138.7	47.6	49.1
5/29	5.8	46.5	90.0	11.7	11.5	13.5	53.0	40.4	85.1	48.5	47.8
					16 plants/ sqft						
4/22	13.8	61.7	106.0	18.7	18.2	70.8	54.7	76.4	106.5	48.9	49.4
5/14	6.8	50.7	93.3	21.7	19.7	70.8	57.2	59.0	137.1	48.0	48.9
5/29	5.2	46.7	91.7	22.8	21.5	70.8	54.7	39.5	90.3	48.1	48.5
LSD	ns	ns	1.8	ns	ns	ns	ns	ns	ns	ns	ns
Pr>0.05	0.2501	0.8249	0.0565	0.6809	0.9021	0.3480	0.0886	0.4000	0.6371	0.5502	0.5850

Emerg: emergence, DAP: days after planting, FLWR: 50% flowering, PM: physiological maturity, STAND 1: plant density prior to bolt, STAND 2: plant density at pod fill, LOD: lodging, HT: height, BIO: biomass, TWT: test weight

Table 8. Effect of variety, seeding date and plant density on agronomic performance of canola -2014

	EMERG DAP	FLWR DAP	PM DAP	STAND 1 SQFT	STAND 2 SQFT	LOD %	HT in	YIELD BU	BIO g/sqft	OIL %	TWT lb/bu
					4/22 - 4 plants/ sqft						
DKL 30-03	13.0	61.7	106.7	4.7	4.3	26.7	59.3	71.8	102.6	50.6	48.8
DKL 70-07	14.7	62.7	109.7	5.0	4.7	16.7	58.7	81.0	108.8	48.9	49.7
					4/22 - 8 plants/ sqft						
DKL 30-03	13.7	61.3	106.7	9.7	8.7	53.3	55.0	79.0	98.4	49.6	49.2
DKL 70-07	14.0	62.0	108.7	10.7	10.3	43.3	57.3	88.4	119	48.6	49.6
					4/22 - 16 plants/ sqft						
DKL 30-03	13.3	61.3	105.0	20.0	19.7	75.0	54.3	76.5	121.2	49.0	49.2
DKL 70-07	14.3	62.0	107.0	17.3	16.7	66.7	55.0	76.3	91.8	48.7	49.7
					5/14 - 4 plants/sqft						
DKL 30-03	7.0	50.0	91.7	6.0	5.7	25.0	59.3	68.7	120.6	49.6	48.4
DKL 70-07	7.3	51.3	94.3	5.0	5.0	25.0	61.3	67.1	109.2	48.5	48.8
					5/14 - 8 plants/sqft						
DKL 30-03	6.7	49.7	92.3	10.3	11.7	46.7	63.0	66.8	131	47.6	48.8
DKL 70-07	7.0	51.7	95.0	11.7	10.7	31.7	59.0	64.2	146.5	47.6	49.4
					5/14 - 16 plants/sqft						
DKL 30-03	6.7	49.7	91.7	21.0	18.7	78.3	57.3	59.9	147.1	48.1	48.6
DKL 70-07	7.0	51.7	95.0	22.3	20.7	63.3	57.0	58.0	127.2	47.8	49.3
					5/29 - 4 plants/sqft						
DKL 30-03	6.3	46.3	89.0	6.3	6.3	7.0	51.0	40.6	68.3	49.0	49.0
DKL 70-07	6.3	48.0	91.7	6.3	6.0	4.3	52.3	31.6	82.8	47.9	46.7
					5/29 - 8 plants/sqft						
DKL 30-03	5.7	46.0	88.0	12.3	12.3	18.3	50.7	48.6	96.3	49.5	47.4
DKL 70-07	6.0	47.0	92.0	11.0	10.7	8.7	55.3	32.3	73.8	47.5	48.2
					5/29 - 16 plants/sqft						
DKL 30-03	5.0	45.3	90.3	26.0	24.0	76.0	54.7	45.4	100.7	48.1	48.7
DKL 70-07	5.3	48.0	93.0	19.7	19.0	65.7	54.7	33.7	79.9	48.1	48.3
LSD	ns	ns	ns	ns	ns	ns	3.0	ns	ns	ns	ns
Pr>0.05	0.6408	0.9088	0.5708	0.5933	0.4652	0.8167	0.0175	0.5039	0.4688	0.5405	0.0609

Emerg: emergence, DAP: days after planting, FLWR: 50% flowering, PM: physiological maturity, STAND 1: plant density prior to bolt, STAND 2: plant density at pod fill, LOD: lodging, HT: height, BIO: biomass, TWT: test weight

Title: Statewide Canola Variety Evaluation, Kalispell – 2014

Objective: To evaluate canola varieties for agronomic performance in environments and cropping systems representative of northwestern Montana.

Results:

The target plant population was 10 plants per square foot (Table 2). Most varieties exceeded this, averaging 12.0 plants/sqft and ranged from 6.3 plants/sqft for Cara to 17.5 plants/sqft for inVigor L140P. Yields averaged 73.2 bu/A and ranged from 41.4 bu/A for Arriba to 84.2 bu/A for InVigor L140P. Fifty percent flowering spanned six days and averaged 176 Julian days (June 25). Physiological maturity was observed in all of the cultivars over a nine day span and averaged 226 Julian days (August 9). Heights averaged 61.9 inches and varied from 56.5 inches for Arriba to 68.4 inches for InVigor 5440. No significant difference was observed for percent lodging or pod shatter. Oil content averaged 47.6% and ranged from 44.9% for Arriba to 50.5% for HyClass 930. Test weight averaged 49.0 lb/bu and ranged from 47.8 lb/bu for Cara and Arriba to 50.6 lb/bu for 6044 RR.

No significant differences were observed among the Green and Grow seed treatments for any of the measured response variables (Table 3).

Table 1. Materials and Methods - Canola Variety Trial - 2014

Seeding Date:	4/22/2014	Harvest Date:	9/5/2014
Julian Date:	112	Julian Date:	248
Seeding Rate:	10 plnt/sqft	Soil Type:	Creston SiL
Previous Crop:	Spring Wheat	Soil Test:	246-24-178
Tillage:	Conventional	Fertilizer:	50-30-40-20
Irrigation:	None	Insecticide:	Warrior 1.5 floz/A
		Fungicide:	Endura 6 oz/A

Table 2. Agronomic data from the statewide canola variety trial, Kalispell, MT - 2014

Variety	Herbicide System	PLNT sqft	FLWR Julian	HT in	LOD %	SHTTR %	PM Julian	YLD lb/A	YLD bu/A	OIL %
DKL 30-03	RR	12.5	173	61.1	55.0	7.5	221	3791.2	75.8	49.5
DKL 30-42	RR	7.5	175	58.3	52.5	4.5	223	3826.4	76.5	48.1
DKL 38-48	RR	13.3	176	60.5	53.8	5.3	225	4133.0	82.7	47.9
DKL 55-55	RR	12.8	174	61.0	57.5	5.5	227	4047.4	80.9	48.3
DKL 70-07	RR	10.8	175	62.8	56.3	8.0	226	3777.0	75.5	48.6
HyClass 955	RR	12.5	175	60.8	61.3	8.0	226	3736.9	74.7	48.6
HyClass 969	RR	16.5	176	59.2	47.5	7.8	227	3532.2	70.6	48.6
HyClass 930	RR	13.5	175	61.3	58.8	5.5	225	4101.6	82.0	50.5
InVigor L130	L	10.5	175	63.5	51.3	3.0	224	3917.4	78.3	46.5
InVigor L140P	L	17.5	178	65.7	63.8	2.8	228	4212.3	84.2	47.2
InVigor L252	L	11.0	178	64.3	50.0	2.8	227	3986.5	79.7	47.8
InVigor 5440	L	14.0	177	68.4	40.0	5.0	226	3808.8	76.2	46.5
6070 RR	RR	12.3	176	62.9	51.3	5.3	230	3953.7	79.1	46.5
6044 RR	RR	10.5	177	63.5	23.8	6.0	226	3309.6	66.2	46.5
Cara	None	6.3	178	59.9	56.3	6.3	226	2323.3	46.5	46.0
Arriba	None	10.8	175	56.5	57.5	9.3	226	2068.8	41.4	44.9
Mean		12.0	175.8	61.9	52.3	5.8	225.8	3657.9	73.2	47.6
CV		30.9	0.7	3.7	27.9	69.3	0.7	12.3	12.3	2.5
LSD		5.3	1.7	3.3	ns	ns	2.1	645.2	12.9	1.7
Pr>F		0.0136	0.0001	0.0001	0.0881	0.5017	0.0001	0.0001	0.0001	0.0001

PLNT: plant, FLWR: 50% flowering, HT: height, LOD: lodging, SHTTR: shatter, PM: physiological maturit
YLD: yield, TWT: test weight, RR: RoundUp, L: Liberty Link, ns: nonsignificant.
Yield and test weight have been adjusted to 8% moisture.

Table 3. Agronomic data from statewide Green and Grow trial, Kalispell, MT - 2014

Treatment	PLNT sqft	FLWR Julian	HT in	LOD %	SHTTR %	PM Julian	YLD lb/A	YLD bu/A	OIL %	TWT lb/bu
HyClass 930 + CTRL 000	14.3	175	60.2	50.0	2.3	225	4282.5	85.7	49.7	49.3
HyClass 930 + AGR 100	13.8	174	60.4	55.0	6.3	225	3932.1	78.6	49.0	48.8
HyClass 930 + AGR 200	13.5	175	58.3	42.5	3.3	225	4586.0	91.7	49.8	48.9
HyClass 930 +AGR 300	12.5	174	60.0	50.0	3.0	224	3906.9	78.1	50.0	49.0
Mean	13.5	174.4	59.7	49.4	3.7	224.8	4176.9	83.5	49.6	49.0
CV	27.1	0.6	3.3	26.6	68.6	0.4	16.7	16.7	1.7	0.9
LSD	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Pr>F	0.9189	0.9030	0.4324	0.6227	0.1940	0.4655	0.4982	0.4982	0.3339	0.5594

AGR: Agriplier seed treatment, PLNT: plant, FLWR: 50% flowering, HT: height, LOD: lodging, SHTTR: shatter, PM: physiological maturity, YLD: yield, TWT: test weight, ns: nonsignificant.
Yield and test weight have been adjusted to 8% moisture.

PULSES

Project Title: Lentil Variety Evaluation – 2014

Objective: To evaluate lentil cultivars for yield and agronomic performance in northwestern Montana.

Results:

Sixteen cultivars were seeded on April 23 as a randomized complete block design with four replicates.

Significant differences were observed among varieties for each agronomic trait (Table 2). Yields averaged 23.4 bu/A, ranging from 11.4 bu/A for Riverland to 41.6 bu/A for Viceroy. Height at pod-fill averaged 19.4 inches and ranged from 16.0 inches for Pardina to 22.8 inches for Imi-Green. Height at physiological maturity averaged 10.2 inches and ranged from 8.0 inches for Pardina to 14.6 inches for CDC Redberry. Days to physiological maturity averaged 218 and ranged from 214 for Crimson to 222 Julian days for Imi-Green. Test weights averaged 58.9 lb/bu and ranged from 53.8 lb/bu for Riverland to 60.9 lb/bu for Morena. Thousand kernel weights averaged 48.7 grams and ranged from 37.4 grams for Viceroy to 73.2 grams for Riverland.

Summary:

Average lentil yields for 2014 were slightly increased compared to 2013, 23.4 bu/A and 22.5 bu/A respectively.

Table 1. Materials and Methods - Lentil Variety Trial - 2014

Seeding Date:	4/23/2014	Harvest Date:	9/4/2014
Julian Date:	113	Julian Date:	252
Seed density:	12-15 seeds/sqft	Soil Type:	Creston SiL
Previous Crop:	Peas	Soil Test:	259-16-172
Tillage:	Conventional	Fertilizer:	9-40-10
Irrigation:	None	Herbicide:	Prowl H20 3pt/A (pre-plant)

Table 2. Lentil agronomic data – 2014

Cultivar	Type	FLWR Julian	HT PF 7/9 in	HT PM 8/5 in	VIN LNGTH @PM in	PM Julian	YLD lb/A	YLD bu/A	TWT lb/bu	TKW g
Viceroy	Small Green	182	18.8	10.6	24.3	219	2498.6	41.6	60.5	37.4
CDC Redberry	Red-Turkish	179	20.9	14.6	21.5	219	1860.2	31.0	60.1	42.5
CDC Impact	Red	180	19.2	10.4	20.5	216	1732.3	28.9	60.8	38.8
Eston	Small Green	177	18.8	9.4	21.0	217	1670.9	27.8	59.4	38.2
CDC Richlea	Med. Green	179	19.7	9.6	23.1	217	1663.2	27.7	57.5	53.5
Avondale (2300R)	Med. Green	176	21.5	10.4	23.3	217	1626.5	27.1	59.1	51.2
CDC Greenland	Large Green	179	19.0	10.9	22.5	219	1551.0	25.9	57.1	67.2
Impress CL	Med. Green	178	20.6	9.5	21.5	217	1428.2	23.8	59.4	53.2
Imi-Green	Med. Green	178	22.8	11.8	26.3	222	1334.6	22.2	58.4	58.2
Essex	Small Green	180	18.7	10.1	21.8	221	1182.6	19.7	59.1	49.4
Merrit	Large Green	174	17.7	9.9	21.3	220	1095.0	18.3	57.3	54.3
Morena	Pardina	175	19.9	10.0	24.0	220	1089.1	18.2	60.9	41.5
Pardina	Pardina	175	16.0	8.0	20.8	215	1080.5	18.0	60.7	41.5
Crimson	Small Red	178	18.6	8.3	19.0	214	1021.9	17.0	60.0	38.1
Red coats	Small Red	182	20.1	10.8	22.5	217	928.0	15.5	58.5	41.0
Riverland	Large Green	175	17.9	9.8	25.3	218	682.1	11.4	53.8	73.2
Mean		178	19.4	10.2	22.4	218	1402.8	23.4	58.9	48.7
CV		0.6	6.0	11.4	7.9	0.9	28.9	28.9	1.14	3.1
LSD		1.6	1.7	1.7	2.5	2.9	579.3	9.65	0.96	2.1
Pr>F		0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

FLWR: 50% flowering, HT PF: height at pod fill, HT PM: height at physiological maturity, PM: physiological maturity, YLD: yield, TWT: test weight, TKW: thousand kernel weight

Project Title: Pea Variety Evaluation – 2014

Objective: To evaluate pea cultivars for yield and agronomic performance.

Results:

Yellow pea yields averaged 83.8 bu/A (Table 2), ranging from 74.0 bu /A for CDC Leroy to 92.8 bu/A for Salamanca. Despite the range in yields there were no statistical differences among cultivars evaluated. Average calendar day to 50% flower was 179 days (June 28) with Navarro being the earliest at 174 days (June 23) to 182 days (August 1) for Spider. Height at pod-fill averaged 47.3 inches and ranged from 43.6 inches for Bridger to 51.1 inches for Earlystar. Universal was the first to reach physiological maturity at 213 days (August 1). Vine length and canopy height at physiological maturity averaged 43.5 inches and 20.5 inches respectively. Test weight averaged 64.3 lb/bu.

Green pea yield averaged 74.9 bu/A. The highest yielding cultivar was Daytona at 90.2 bu/A (Table 3). Average Julian calendar day to 50% flower was 179 (June 28) and ranged 175 to 181 Julian calendar days. Physiological maturity was observed at an average of 214 Julian days (August 2) and ranged from 212 to 216 days. Height at pod-fill averaged 43.9 inches and ranged from 40.0 inches for Arcadia to 48.4 inches for Daytona. Test weight averaged 62.7 lb/bu and ranged from 61.3 lb/bu for Aragorn to 64.2lb/bu Greenwood. No significant difference was observed in vine length and height at physiological maturity.

Summary:

Pea yields were slightly higher than in 2013 most likely due to the favorable growing season; timely spring rains, low insect, disease and weed pressures, and no hail during pod and seed development.

Table 1. Materials and Methods - Pea Variety Trial - 2014

Seeding Date:	4/23/2014	Harvest Date:	8/13/2014
Julian Date:	113	Julian Date:	225
Seeding Rate:	8-10 plants/sqft	Soil Test:	259-16-172
Previous Crop:	Peas	Fertilizer:	9-40-10
Tillage:	Conventional	Herbicide:	Prowl H20 3pt/A (pre-plant),
Irrigation:	None		Raptor 3 floz/A , Basagran 12 floz/A,
Soil Type:	Creston SiL		0.25% NIS

Table 2. Yellow pea agronomic data - 2014

Cultivar	FLR Julian	HT PF in	HT PM in	VINE LGTH @ PM	PM Julian	YLD lb/A	YLD bu/A	TWT lb/bu
Salamanca	179	50.9	16.0	47.8	214	5569.4	92.8	63.9
CDC Treasure	179	50.6	15.5	47.8	214	5488.3	91.5	65.0
Earlystar	178	51.1	19.8	43.8	214	5306.4	88.4	64.4
Navarro	174	45.0	30.0	42.8	215	5230.0	87.2	64.3
Jet Set	181	44.5	22.8	43.5	217	5208.9	86.8	63.2
Pro 127-2	179	48.8	14.0	45.9	215	5133.1	85.6	64.1
DS Admiral	179	50.1	16.5	48.3	216	5017.9	83.6	63.8
Montech 4152	179	49.0	22.0	44.3	217	5008.7	83.5	65.6
Spider	182	47.6	12.5	44.3	218	4890.5	81.5	64.1
SW Midas	181	45.5	17.8	38.4	215	4887.5	81.5	64.5
Agassiz	181	45.6	25.3	39.3	218	4868.6	81.1	63.3
Universal	175	44.1	24.5	41.0	213	4726.5	78.8	62.8
Bridger	177	43.6	31.8	39.0	215	4632.3	77.2	65.9
CDC Leroy	181	45.9	18.8	42.5	217	4440.3	74.0	65.8
Mean	179	47.3	20.5	43.5	215	5029.2	83.8	64.3
CV	0.4	4.2	26.5	9.5	0.8	10.1	10.1	1.1
LSD	1.1	2.8	7.8	5.9	2.4	ns	ns	1.0
Pr>F	0.0001	0.0001	0.0001	0.0143	0.0017	0.1365	0.1365	0.0001

Table 3. Green pea agronomic data - 2014

Cultivar	FLR Julian	HT PF in	HT PM IN	VINE LGTH @ PM	PM Julian	YLD lb/A	YLD bu/A	TWT lb/bu
Daytona	181	48.4	23.8	42.5	216	5413.3	90.2	63.9
Greenwood	177	42.4	18.5	39.5	214	4787.1	79.8	64.2
Crusier	177	46.3	13.5	44.4	214	4605.1	76.8	62.0
Majoret	181	43.6	15.8	39.4	215	4430.3	73.8	63.3
Ginny	179	42.1	14.0	38.8	212	4323.9	72.1	62.3
Arcadia	181	40.0	11.8	36.4	212	4283.3	71.4	62.2
Aragorn	175	43.9	11.5	43.3	213	4157.9	69.3	61.3
CDC Striker	181	44.8	13.3	43.5	214	3934.2	65.6	62.7
Mean	179	43.9	15.3	41.0	214	4491.9	74.9	62.7
CV	0.6	4.5	35.7	10.5	0.6	11.6	11.6	1.4
LSD	1.5	2.9	ns	ns	1.9	767.8	12.8	1.3
Pr>F	0.0001	0.0002	0.0683	0.1568	0.0108	0.0235	0.0235	0.0021

FLR: 50% flower, HT PF: height at pod fill, HT PM: height at physiological maturity,
VINE LGTH @ PM: vine length at physiological maturity in inches,
PM: physiological maturity, YLD: yield, TWT: test weight, ns: nonsignificant.